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THERMA V™ System

GENERAL SVC MANUAL

MODEL : AHBW***A0
AHBW036H0

CAUTION

Before servicing the unit, read the safety precautions in general SVC manual.
Only for authorized service personnel.

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Safety Precautions

To prevent injury to the user or other people and property damage, the following instructions must be followed.

- Be sure to read before installing the product.
- Be sure to observe the cautions specified here as they include important items related to safety.
- Incorrect operation due to ignoring instruction will cause harm or damage. The seriousness is classified by the following indications.

⚠WARNING	This symbol indicates the possibility of death or serious injury.
⚠CAUTION	This symbol indicates the possibility of injury or damage to properties only.

■ Meanings of symbols used in this manual are as shown below.

	Be sure not to do.
	Be sure to follow the instruction.

⚠WARNING

Always ground the product.

- There is a risk of electric shock.

Do not use a defective or underrated circuit breaker. Use the correctly rated breaker and fuse.

- There is risk of fire or electric shock.

Do not use a multi consent. Always use this appliance on a dedicated cicuit and breaker.

- Otherwise it can cause electric shock or fire.

For electrical work, contact the dealer, seller, a qualified electrician, or an Authorized Service Center. Do not disassemble or repair the product by yourself.

- There is risk of fire or electric shock.

Always ground the product as per the wiring diagram. Do not connect the ground wire to gas or water pipes lightening rod or telephone ground wire.

- There is risk of fire or electric shock.

Install the panel and the cover of control box securely.

- There is risk of fire or electric shock due to dust , water etc.

Use the correctly rated breaker or fuse.

- There is risk of fire or electric shock.

Do not modify or extend the power cable. If the power cable or cord has scrathes or skin peeled off or deteriorated then it must be replaced.

- There is risk of fire or electric shock.

For installation, removal or reinstall , always contact the dealer or an Authorized Service Center.

- There is risk of fire, electric shock, explosion, or injury.

Do not install the product on a defective installation stand. Be sure that the installation area does not deteriorate with age.

- It may cause product to fall.

Never install the outdoor unit on a moving base or a place from where it can fall down.

- The falling outdoor unit can cause damage or injury or even death of a person.

When the product is soaked (flooded or submerged) in water , contact an Authorized Service Center for repair before using it again.

- There is risk of fire or eletric shock.

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Indoor/outdoor wiring connections must be secured tightly and the cable should be routed properly so that there is no force pulling the cable from the connection terminals.

- Improper or loose connections can cause heat generation or fire.

Safely dispose off the packing materials. Like screws, nails, batteries, broken things etc after installation or svc and then tear away and thraw away the plastic packaging bags.

- Children may play with them and cause injury.

Make sure to check that the power cable plug is not dirty, loose or broken and then only insert the plug completely.

- Dirty, loose or broken power plug can cause electric shock or fire.

In outdoor unit the step-up capacitor supplies high voltage electricity to the electrical components. Be sure to discharge the capacitor completely before conducting the repair work.

- An charged capacitor can cause electrical shock.

When installing the unit, use the installation kit provided with the product.

- Otherwise the unit may fall and cause severe injury.

Be sure to use only those parts which are listed in the svc parts list. Never attempt to modify the equipment.

- The use of inappropriate parts can cause an electrical shock, excessive heat generation or fire.

Be cautious when unpacking and installing the product.

- Sharp edges could cause injury. Especially careful on the product edges and the fins on the heat exchanger.

Do not open the front grille of the product during operation. (Do not touch the electrostatic filter, if the unit is so equipped.)

- There is risk of physical injury, electric shock, or product failure.

If strange sounds, smell or smoke comes from product. Immediately turn the breaker off or disconnect the power supply cable.

- There is risk of electric shock or fire.

Be cautious that water could not be poured to the product directly.

- There is risk of fire, electric shock, or product damage.

Turn the main power off and unplug the unit when cleaning or repairing the product.

- There is risk of electric shock.

When the product is not to be used for a long time, disconnect the power supply plug or turn off the breaker.

- There is risk of product damage or failure, or unintended operation.

Take care to ensure that nobody especially kids could step on or fall onto the outdoor unit.

- This could result in personal injury and product damage.

Take care to ensure that power cable could not be pulled out or damaged during operation.

- There is risk of fire or electric shock.

Do not place ANYTHING on the power cable.

- There is risk of fire or electric shock.

Do not plug or unplug the power supply plug to turn the unit ON / OFF

- There is risk of fire or electric shock.

When flammable gas leaks, turn off the gas and open a window for ventilation before turn the product on.

- Do not use the telephone or turn switches on or off. There is risk of explosion or fire.

Special warning about no operation for long-time

- If the product is not used for long time, we strongly recommend not to switch off the power supply to the product.
- If power is not supplied, some special product-protecting actions (such as water pump anti-locking) will not performed.

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The refrigerant of this product is R410A.

• The installation tool such as manifold gauge should be complied with R410A.

⚠CAUTION

Two or more people must lift and transport the product.

• Avoid personal injury.

Do not install the product where it will be exposed to sea wind (salt spray) directly.

• It may cause corrosion on the product.

Install the drain hose to ensure that the condensed water is drained away properly.

• A bad connection may cause water leakage.

Keep level even when installing the product.

• To avoid vibration or noise.

Do not install the product where the noise or hot air from the outdoor unit could damage or disturb the neighborhoods.

• It may cause a problem for your neighbors and hence dispute.

Always check for gas (refrigerant) leakage after installation or repair of product.

• Low refrigerant levels may cause failure of product.

Do not use the product for special purposes, such as preserving foods, works of art, etc. It is a customer's product, not a precision refrigeration system.

• There is risk of damage or loss of property.

Do not block the inlet or outlet of air flow.

• It may cause product failure.

Use a soft cloth to clean. Do not use harsh detergents, solvents or splashing water etc .

• There is risk of fire, electric shock, or damage to the plastic parts of the product.

Do not step on or put anyting on the product. (outdoor units)

• There is risk of personal injury and failure of product.

Do not insert hands or other objects through the air inlet or outlet while the product is operating.

• There are sharp and moving parts that could cause personal injury.

Be cautious when unpacking and installing the product.

• Sharp edges could cause injury.

If the refrigerant gas leaks during the repair, do not touch the leakaing refrigerant gas.

• The refrigernat gas can cause frostbite (cold burn)

Do not mix air or gas other than the specified refrigerant used in the system .

• If air enters the refrigerant system, an excessively high pressure results, causing equipment damage or injury.

If the refrigerant gas leaks during the installation, ventilate the area immediately.

• Otherwise it can be harmfull for your health.

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Dismantling the unit, treatment of the refrigerant oil and eventual parts should be done in accordance with local and national standards.

Replace the all batteries in the remote control with new ones of the same type. Do not mix old and new batteries or different types of batteries.

- There is risk of fire or product failure.

Do not recharge or disassemble the batteries. Do not dispose off batteries in a fire.

- They may burn or explode.

If the liquid from the batteries gets onto your skin or clothes, wash it well with clean water. Do not use the remote if the batteries have leaked.

- The chemicals in batteries could cause burns or other health hazards.

Do not expose your skin or kids or plants to the cool or hot air draft.

- This could harm to your health.

Do not drink the water drained from the product.

- It is not sanitary and could cause serious health issues.

Use a firm stool or ladder when cleaning, maintaining or repairing the product at an height.

- Be careful and avoid personal injury.

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Part 1
General Information

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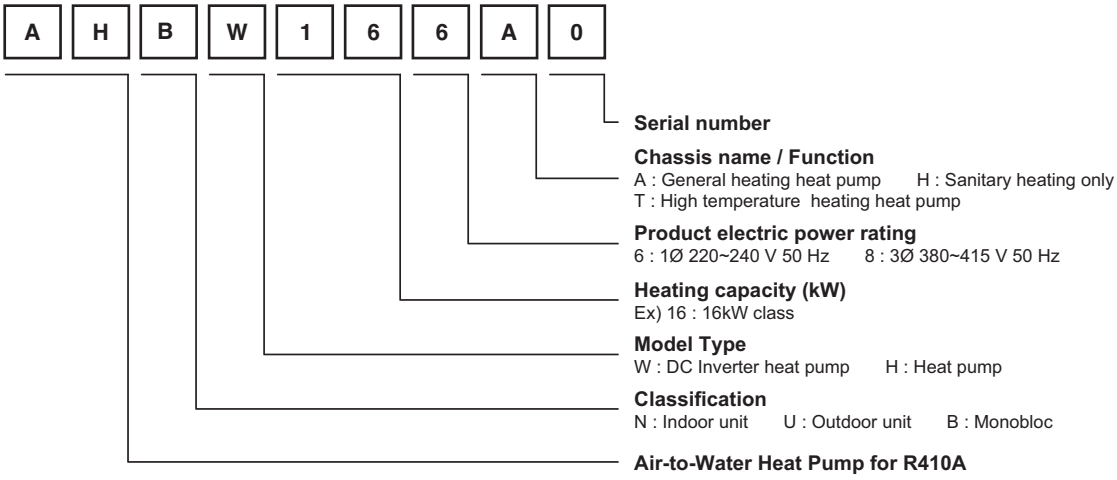
1. Model Information

With advanced inverter technology, THERMA V is suitable for applications like under floor heating and hot water generation. By Interfacing to various accessories user can customize the range of the application.

In this chapter, general information of THERMA V is presented to identify the installation procedure. Before beginning installation, read this chapter carefully and find helpful information on installation.

1. Model Information

Model number nomenclature


A H B W 1 6 6 A 0
Serial number
Chassis name / Function
A : General heating heat pump H : Sanitary heating only
T : High temperature heating heat pump
Product electric power rating
6 : 1Ø 220~240 V 50 Hz 8 : 3Ø 380~415 V 50 Hz
Heating capacity (kW)
Ex) 16 : 16kW class
Model Type
W : DC Inverter heat pump H : Heat pump
Classification
N : Indoor unit U : Outdoor unit B : Monobloc
Air-to-Water Heat Pump for R410A

Model name and related information

Model name	Capacity		Power source (Unit)	Power source (Electric heater)
	Cooling (kW)*1	Heating (kW)*2		
AHBW036H0	3	3.2	1Ø 220-240 V 50 Hz	-
AHBW056A0	5	5	1Ø 220-240 V 50 Hz	1Ø 220-240 V 50 Hz
AHBW076A0	7	7	1Ø 220-240 V 50 Hz	1Ø 220-240 V 50 Hz
AHBW096A0	9	9	1Ø 220-240 V 50 Hz	1Ø 220-240 V 50 Hz
AHBW126A0	14.5	12	1Ø 220-240 V 50 Hz	1Ø 220-240 V 50 Hz
AHBW146A0	15.5	14	1Ø 220-240 V 50 Hz	1Ø 220-240 V 50 Hz
AHBW166A0	16.1	16	1Ø 220-240 V 50 Hz	1Ø 220-240 V 50 Hz
AHBW128A0	14.5	12	3 Ø 380-415 V 50 Hz	3 Ø 380-415 V 50 Hz
AHBW148A0	15.5	14	3 Ø 380-415 V 50 Hz	3 Ø 380-415 V 50 Hz
AHBW168A0	16.1	16	3 Ø 380-415 V 50 Hz	3 Ø 380-415 V 50 Hz

*1 : Tested under Eurovent Heating condition (Inlet water temperature 30 °C → 35 °C at outdoor ambient temperature 7 °C / 6 °C)

*2 : Tested under Eurovent Heating condition (Inlet water temperature 23 °C → 18 °C at outdoor ambient temperature 35 °C / 24 °C)

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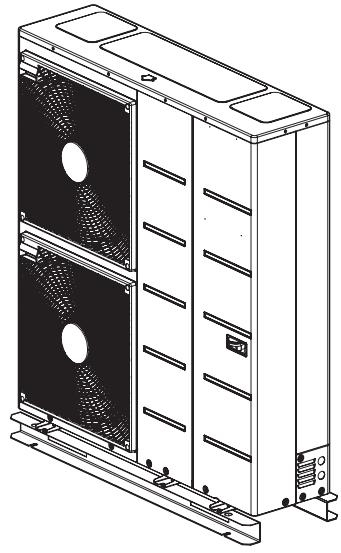
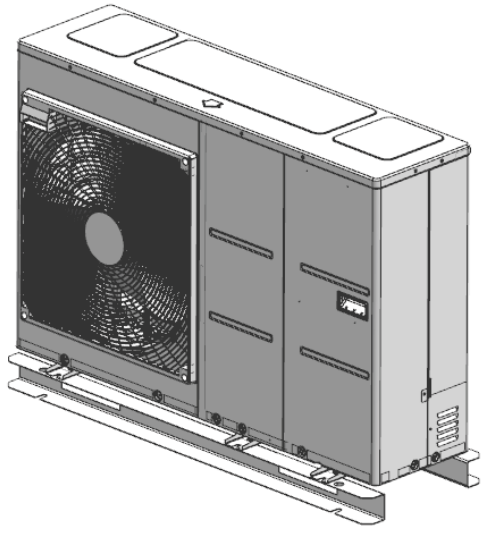
2. External Apprearance

2.1 Unit

UN3 chassis



UN4 chassis



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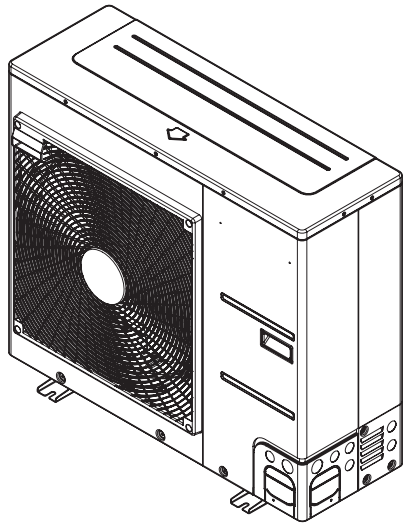
UN4 chassis



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Part 2
Features & Controls

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1. List of Function

Category	Function	AHBW056A0	AHBW076A0	AHBW096A0
Installation	Drain pump	-	-	-
	E.S.P. control	-	-	-
	Indoor Box	-		
	High ceiling operation	-	-	-
Reliability	Hot start	-	-	-
	Self diagnosis	O	O	O
	Soft dry operation	-	-	-
	Defrost / Deicing	O	O	O
	High pressure switch	O	O	O
	Low pressure switch	O	O	O
	Phase protection	-	-	-
	Restart delay (3-minutes)	O	O	O
	Self diagnosis	O	O	O
	Soft start	-	-	-
	Test function	-	-	-
Convenience	Auto changeover	-	-	-
	Auto cleaning	-	-	-
	Auto operation (artificial intelligence)	-	-	-
	Auto restart operation	O	O	O
	Child lock	O	O	O
	Forced operation	-	-	-
	Group control	-	-	-
	Sleep mode	-	-	-
	Timer (on/off)	O	O	O
	Timer (weekly)	O	O	O
	Two thermistor control	-	-	-
Individual control	Standard wired remote controller (control panel)	O	O	O
	Deluxe wired remote controller	-	-	-
	Simple wired remote controller	-	-	-
	Wired remote controller (for hotel use)	-	-	-
	Wireless remote controller (simple)	-	-	-
	Wireless LCD remote control	-	-	-
CAC network function	General central controller (Non LGAP)	-	-	-
	Dry contact (PQDSA)	O	O	O
	Network Soluation (LGAP)	O	O	O
	PDI (power distribution indicator)	-	-	-
	PI 485	PMNFP14A0	PMNFP14A0	PMNFP14A0
Special function kit	Zone control	-	-	-
	CTIE	-	-	-
	Electro thermostat	-	-	-
	Low ambient operation	-	-	-
Others	Remote room temperature sensor (TH8)	PQRSTA0	PQRSTA0	PQRSTA0
	Thermistor	-	-	-
AWHP	Water Pump ON / OFF Control	O	O	O
	Flow Switch Control	O	O	O
	Thermostat Interface (230 V AC)	O	O	O
	Thermostat Interface (24 V AC)	O	O	O
	Sanitary Tank Heating	O	O	O
	PHEX Anti-Freezing Control	O	O	O
	Water Pump Forced Operation	O	O	O
	Autosetting according to Ambient Temperature	O	O	O
	Silent Operation	O	O	O
	Anti-overheating of Water Pipe	O	O	O
	Emergency Operation	O	O	O
	Screed drying	O	O	O

Notes
O : Applied, X : Not applied, – : No relation
* Accessory: Installed at field, ordered and purchased separately by the corresponding model name, supplied with separate package.

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Category	Function	AHBW126A0	AHBW146A0	AHBW166A0
Installation	Drain pump	-	-	-
	E.S.P. control	-	-	-
	Indoor Box		-	
	High ceiling operation	-	-	-
Reliability	Hot start	-	-	-
	Self diagnosis	O	O	O
	Soft dry operation	-	-	-
	Defrost / Deicing	O	O	O
	High pressure switch	O	O	O
	Low pressure switch	O	O	O
	Phase protection	-	-	-
	Restart delay (3-minutes)	O	O	O
	Self diagnosis	O	O	O
	Soft start	-	-	-
	Test function	-	-	-
Convenience	Auto changeover	-	-	-
	Auto cleaning	-	-	-
	Auto operation (artificial intelligence)	-	-	-
	Auto restart operation	O	O	O
	Child lock	O	O	O
	Forced operation	-	-	-
	Group control	-	-	-
	Sleep mode	-	-	-
	Timer (on/off)	O	O	O
	Timer (weekly)	O	O	O
	Two thermistor control	-	-	-
Individual control	Standard wired remote controller (control panel)	O	O	O
	Deluxe wired remote controller	-	-	-
	Simple wired remote controller	-	-	-
	Wired remote controller (for hotel use)	-	-	-
	Wireless remote controller (simple)	-	-	-
	Wireless LCD remote control	-	-	-
CAC network function	General central controller (Non LGAP)	-	-	-
	Dry contact (PQDSA)	O	O	O
	Network Soluation (LGAP)	O	O	O
	PDI (power distribution indicator)	-	-	-
	PI 485	PMNFP14A0	PMNFP14A0	PMNFP14A0
Special function kit	Zone control	-	-	-
	CTIE	-	-	-
	Electro thermostat	-	-	-
	Low ambient operation	-	-	-
Others	Remote room temperature sensor (TH8)	PQRSTA0	PQRSTA0	PQRSTA0
	Thermistor	-	-	-
AWHP	Water Pump ON / OFF Control	O	O	O
	Flow Switch Control	O	O	O
	Thermostat Interface (230 V AC)	O	O	O
	Thermostat Interface (24 V AC)	O	O	O
	Sanitary Tank Heating	O	O	O
	PHEX Anti-Freezing Control	O	O	O
	Water Pump Forced Operation	O	O	O
	Autosetting according to Ambient Temperature	O	O	O
	Silent Operation	O	O	O
	Anti-overheating of Water Pipe	O	O	O
	Emergency Operation	O	O	O
	Screed drying	O	O	O

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Category	Function	AHBW128A0	AHBW148A0	AHBW168A0
Installation	Drain pump	-	-	-
	E.S.P. control	-	-	-
	Indoor Box		-	
	High ceiling operation	-	-	-
Reliability	Hot start	-	-	-
	Self diagnosis	O	O	O
	Soft dry operation	-	-	-
	Defrost / Deicing	O	O	O
	High pressure switch	O	O	O
	Low pressure switch	O	O	O
	Phase protection	-	-	-
	Restart delay (3-minutes)	O	O	O
	Self diagnosis	O	O	O
	Soft start	-	-	-
	Test function	-	-	-
Convenience	Auto changeover	-	-	-
	Auto cleaning	-	-	-
	Auto operation (artificial intelligence)	-	-	-
	Auto restart operation	O	O	O
	Child lock	O	O	O
	Forced operation	-	-	-
	Group control	-	-	-
	Sleep mode	-	-	-
	Timer (on/off)	O	O	O
	Timer (weekly)	O	O	O
	Two thermistor control	-	-	-
Individual control	Standard wired remote controller (control panel)	O	O	O
	Deluxe wired remote controller	-	-	-
	Simple wired remote controller	-	-	-
	Wired remote controller (for hotel use)	-	-	-
	Wireless remote controller (simple)	-	-	-
	Wireless LCD remote control	-	-	-
CAC network function	General central controller (Non LGAP)	-	-	-
	Dry contact (PQDSA)	O	O	O
	Network Soluation (LGAP)	O	O	O
	PDI (power distribution indicator)	-	-	-
	PI 485	PMNFP14A0	PMNFP14A0	PMNFP14A0
Special function kit	Zone control	-	-	-
	CTIE	-	-	-
	Electro thermostat	-	-	-
	Low ambient operation	-	-	-
Others	Remote room temperature sensor (TH8)	PQRSTA0	PQRSTA0	PQRSTA0
	Thermistor	-	-	-
AWHP	Water Pump ON / OFF Control	O	O	O
	Flow Switch Control	O	O	O
	Thermostat Interface (230 V AC)	O	O	O
	Thermostat Interface (24 V AC)	O	O	O
	Sanitary Tank Heating	O	O	O
	PHEX Anti-Freezing Control	O	O	O
	Water Pump Forced Operation	O	O	O
	Autosetting according to Ambient Temperature	O	O	O
	Silent Operation	O	O	O
	Anti-overheating of Water Pipe	O	O	O
	Emergency Operation	O	O	O
	Screed drying	O	O	O

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Category	Function	AHBW036H0
Installation	Drain pump	-
	E.S.P. control	-
	Indoor Box	-
	High ceiling operation	-
Reliability	Hot start	-
	Self diagnosis	O
	Soft dry operation	-
	Defrost / Deicing	O
	High pressure switch	O
	Low pressure switch	O
	Phase protection	-
	Restart delay (3-minutes)	O
	Self diagnosis	O
	Soft start	-
	Test function	-
Convenience	Auto changeover	-
	Auto cleaning	-
	Auto operation (artificial intelligence)	-
	Auto restart operation	O
	Child lock	O
	Forced operation	-
	Group control	-
	Sleep mode	-
	Timer (on/off)	O
	Timer (weekly)	O
	Two thermistor control	-
Individual control	Standard wired remote controller (control panel)	O
	Deluxe wired remote controller	-
	Simple wired remote controller	-
	Wired remote controller (for hotel use)	-
	Wireless remote controller (simple)	-
	Wireless LCD remote control	-
CAC network function	General central controller (Non LGAP)	-
	Dry contact (PQDSA)	O
	Network Soluation (LGAP)	O
	PDI (power distribution indicator)	-
	PI 485	PMNFP14A0
Special function kit	Zone control	-
	CTIE	-
	Electro thermostat	-
	Low ambient operation	-
Others	Remote room temperature sensor (TH8)	PQRSTA0
	Thermistor	-
AWHP	Water Pump ON / OFF Control	O
	Flow Switch Control	O
	Thermostat Interface (230 V AC)	O
	Thermostat Interface (24 V AC)	O
	Sanitary Tank Heating	O
	PHEX Anti-Freezing Control	O
	Water Pump Forced Operation	O
	Autosetting according to Ambient Temperature	O
	Silent Operation	O
	Anti-overheating of Water Pipe	O
	Emergency Operation	-
	Screed drying	O

Notes
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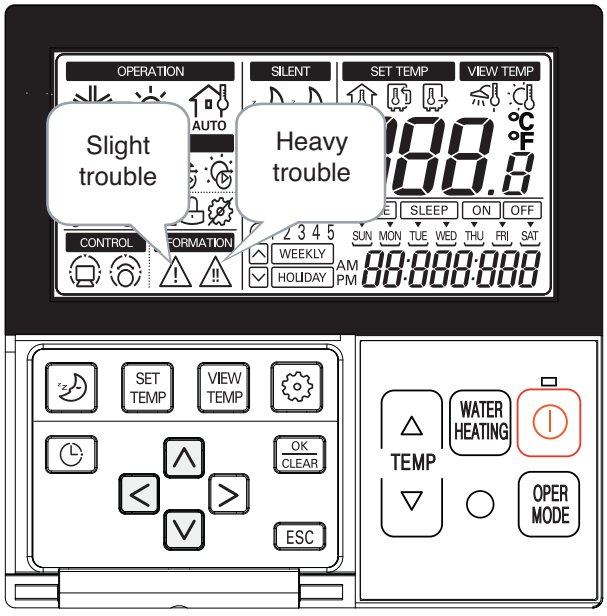
2. Features

1. Summarized Features

1.1 Emergency control



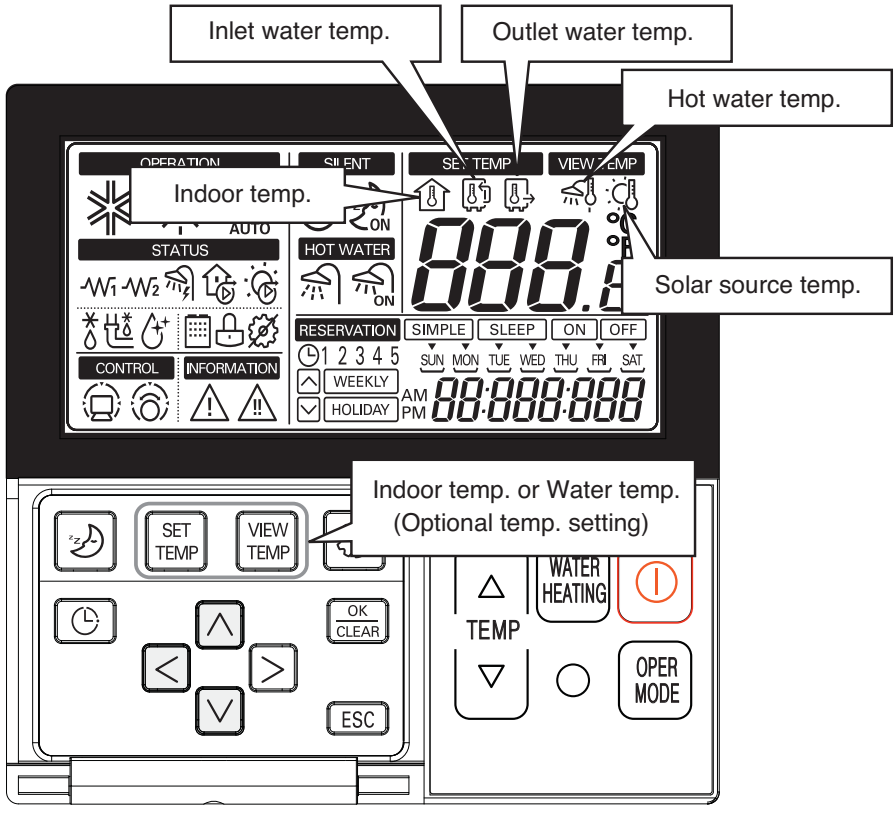
Easy checking of system failure

- Slight / Heavy trouble

Emergency operating

- Heavey trouble
- Electric heater ON
- Secure at least heating before A/S

1.2 Display panel



※ Some functions may not be operated and displayed depending on the model.

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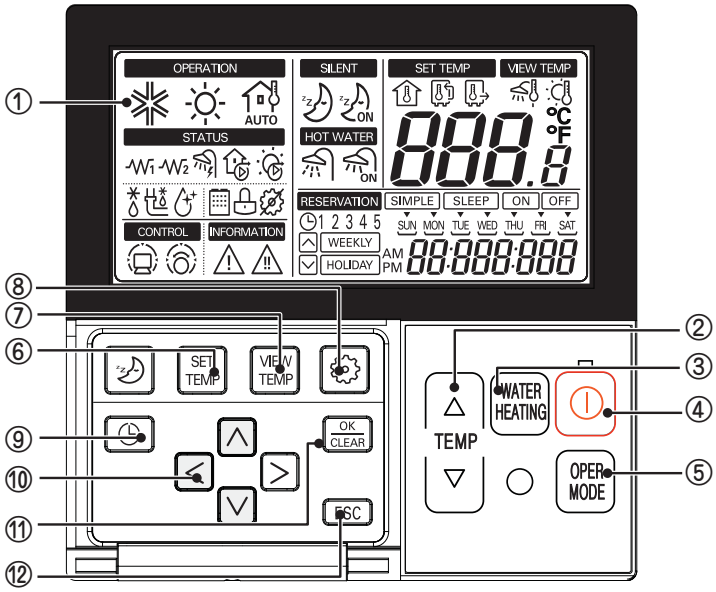
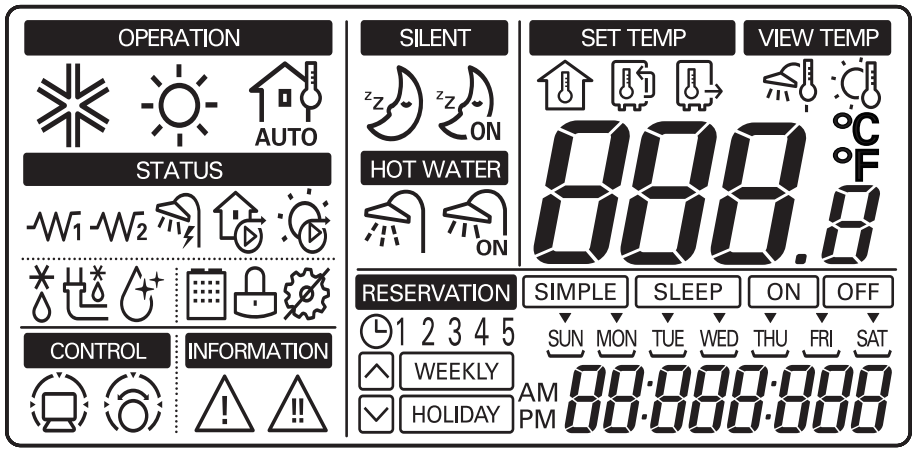
1.3 Control Panel

• Controller configuration



① **Display panel**
② **Change temperature button**
③ **Water heating enable / disable button**
④ **Power button**
⑤ **Mode heating button**
⑥ **Temperature setting mode button**
⑦ **Temperature view mode button**
⑧ **Function setting button**
⑨ **Programming button**
⑩ **Direction button (up, down, left, right)**
⑪ **OK / CLEAR button**
⑫ **ESC button**

• Display panel



	Heating		Water Tank Electric Heater		Water-Pipe Anti Freezing
	Weather-dependent Heating		Water Pump		Water Tank Disinfection
	Space Temp.		Solar Heating Pump		Outdoor Unit
	Water Inlet Temp.		Water Tank Heating Enable / Disable		Child Lock
	Water Outlet Temp.		Water Tank Heating (by Heat Pump)		Not Available Function
	Central Controller		Silent Mode ON / OFF		Slight Trouble
	Thermostat		Water Tank Temp.		Heavy Trouble
	Electric Heater (1)		Solar Heating Temp.		
	Electric Heater (2)		Defrost		

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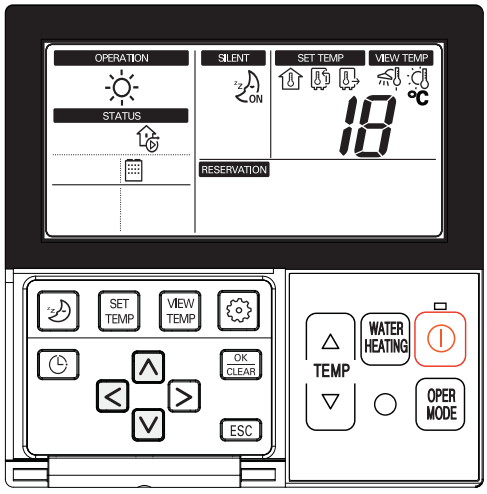
2. Special Function

2.1 Child Lock Function

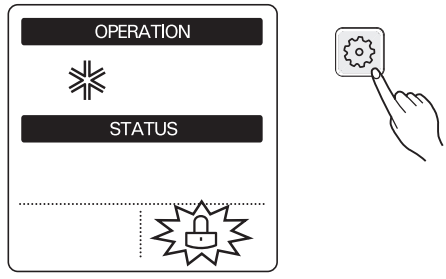
This function prevents children or others from tampering with the control buttons on the unit.

• All the buttons on indoor display panel will blocked.

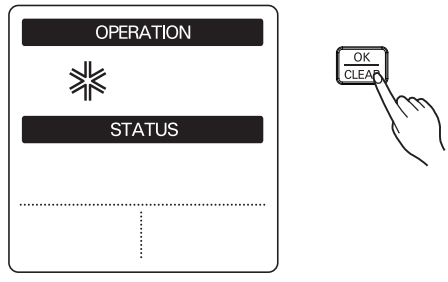
The function is used to restrict children to not to use the AWHP carelessly.(CL is an abbreviated form of Child Lock.)



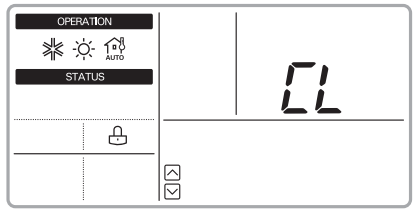
1 Press Function Setting button to enter user setting mode.
(The segment will be flashed)



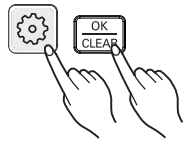
2 Press OK / CLEAR button to finish the selection. The segment will be disappear.



3 During Child Lock, icon and 'CL' will be displayed during 3 seconds whenever entering any kind of buttons except for view temperature button and setting/clear button .



4 To release this setting, pressing function setting button until icon flash and then enter setting/clear button.



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2.2 Sleep Timer Operation

• When the sleep time is reached after <1,2,3,4,5,6,7,0(cancel) hr> is input by the control panel while in appliance operation, the operation of the appliance stops.

• While the appliance is on pause, the sleep timer mode cannot be input.

2.3 Timer (On / Off)

2.3.1 On-Timer Operation

• When the set time is reached after the time is input by the control panel, the appliance starts to operate.

• The timer LED is on when the on-timer is input. It is off when the time set by the timer is reached.

• If the appliance is operating at the time set by the timer, the operation continues.

2.3.2 Off-Timer Operation

• When the set time is reached after the time is input by the control panel, the appliance stops operating.

• The timer LED is on when the off-timer is input. It is off when the time set by the timer is reached.

• If the appliance is on pause at the time set by the timer, the pause continues.

2.4 Weekly Program

• If necessary, an operator can make an On / Off reservation of the product for a period of one week.

- On / Off schedule of operation for a period of one week.

• No need to turn the unit On / Off manually during working days.
On / Off time is scheduled in micom of the wired remote control.

Operation Time Table (Example)

Setting	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Temp.	25 °C	25 °C	25 °C	25 °C	25 °C	Off	
On	09:00	08:00	09:00	08:00	09:00		
Off	12:00	17:00	12:00	12:00	12:00		

2.5 Sanitary Tank Heating Scheduler & Sanitary Tank Heater Scheduler

• If necessary, enable or disable of sanitary tank heating or sanitary tank heater can be programmed according to user's specific time.

• Schedulers are operating everyday.

2.6 Silent mode operation

• If necessary, enable or disable of silent mode can be programmed according to user's specific time.

2.7 Screed drying

• If necessary, enable or disable of screed drying can be programmed according to user's setting.

• While the screed drying mode is operating, "Dry" is displayed.

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3. System Set-up

As THERMA V is designed to satisfy various installation environment, it is important to set up system correctly. If not configured correctly, improper operation or degrade of performance can be expected.

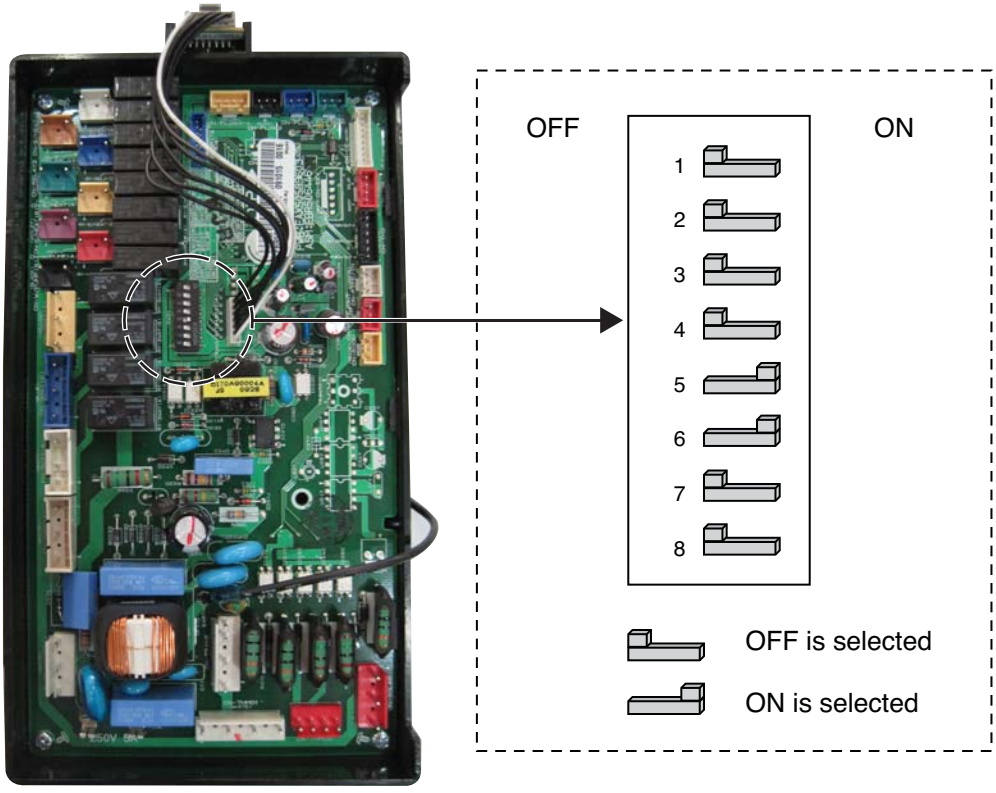
3.1 DIP Switch Setting

⚠CAUTION

Turn off electric power supply before setting DIP switch

• Whenever adjusting DIP switch, turn off electric power supply to avoid electric shock.

General information



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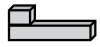
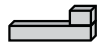
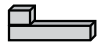
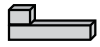
DIP switch setting

Description	Setting	Default
Role when central controller is equipped	1 As Master 1 As Slave	1 
Accessory installation information	2 3 Unit is installed 2 3 Unit + Sanitary water tank is installed	2 3
Emergency operation Level	4 High temperature cycle 4 Low temperature cycle	4
External water pump installation information	5 External water pump is NOT installed 5 External water pump is installed	5 
Selecting electric heater capacity	6 7 Step 2 capacity is used 6 7 Step 1 capacity is used 6 7 Electric heater is not used	6 7 
Thermostat installation information	8 Thermostat is NOT installed 8 Thermostat is installed	8 

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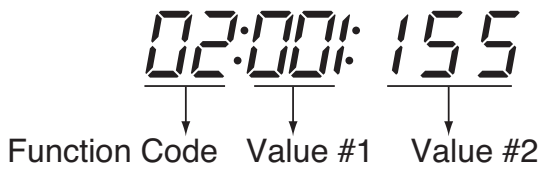
3.2 Control Panel Setting

Summary

Example of function code display



Common setting

• **Function Code 01** : Test run
Test run should be performed when additional refrigerant charging is required. To charge the refrigerant, the product must run in Cooling mode. Test run instantly makes the product working in cooling mode for 18 minutes.

Note: • If you press any kind of button during this mode, Test run mode will be finished.
• After running 18 minutes under test run mode, system will automatically turn OFF.

• **Function Code 02** : Disable 3 minute delay
Factory use only.

• **Function Code 03** : Remote air sensor connection
If user connects remote air sensor to control the product by room air temperature, the connection information should be notified to the product.

Note : If remote air sensor is connected but this function code is not set correctly, the product can not be controlled by room air temperature.

• **Function Code 04** : Celsius / Fahrenheit switching
Temperature is displayed in Celsius or Fahrenheit.

• **Function Code 05** : Setting temperature selection
The product can be operated according to air temperature or leaving water temperature. The selection for setting temperature as air temperature or leaving water temperature is determined.

Note : Note: Air temperature as setting temperature is ONLY available when remote air sensor connection is enabled and Function Code 03 is set as 02.

• **Function Code 06** : Auto dry contact
This function allows the dry contact operate under auto run mode or manual mode with remote controller.

• **Function Code 07** : Address setting
When central controller is installed, address assigning is set by this function.

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Temperature range setting

• **Function Code 13** : Setting air temperature in heating mode
Determine heating setting temperature range when air temperature is selected as setting temperature.

⚠WARNING

Only available when remote air temperature sensor is connected
• Accessory PQRSTA0 should be installed.
• Also, Function Code 03 should be set properly.

• **Function Code 14** : Setting leaving water temperature in heating mode
Determine heating setting temperature range when leaving water temperature is selected as setting temperature.

• **Function Code 15** : Setting sanitary tank leaving water temperature
Determine heating setting temperature range of water tank leaving water.

⚠WARNING

Only available when sanitary water tank feature is installed
• Sanitary water tank and sanitary water tank kit should be installed.
• DIP switch No. 2 and 3 should be set properly.

• **Function Code 18** : Screed drying mode.
After installing water pipes for under floor heating, user can select screed drying mode for curing the cement.
- Value #1 : “01” Screed drying mode operating
“00” Screed drying mode is not operating.
- Value #2 : not used.

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Temperature control parameter setting and etc

• **Function Code 21** : Setting electric heater on / off temperature

Using Half capacity of electric heater : when DIP switch No. 6 and 7 is set as 'OFF-ON' :

- Value #1 : outdoor air temperature where half capacity of electric heater starts operation.
- Value #2 : not used.
- Example : If Value #1 is set as '-1' and DIP switch No 6. and 7 is set as 'OFF-ON', then half capacity of electric heater will start operation when outdoor air temperature is below -1 °C … and current leaving water temperature or room air temperature is much belower than target leaving water temperature or target room air temperature.

Using Full capacity of electric heater : when DIP switch No. 6 and 7 is set as 'OFF-OFF' :

- Value #1 : base outdoor air temperature.
- Value #2 : not used.
- Example : If Value #1 is set as '-1' and DIP switch No 6. and 7 is set as 'OFF-OFF', then full capacity of electric heater will start operation when outdoor air temperature is below -1 °C and current leaving water temperature or room air temperature is much belower than target leaving water temperature or target room air temperature.

⚠ WARNING

FCU Installation

• If FCU is used, related 2way valve should be installed and connected to the unit PCB.

• If Value #2 is set as '00' but FCU or 2way valve is NOT installed, the product can be operated abnormally.

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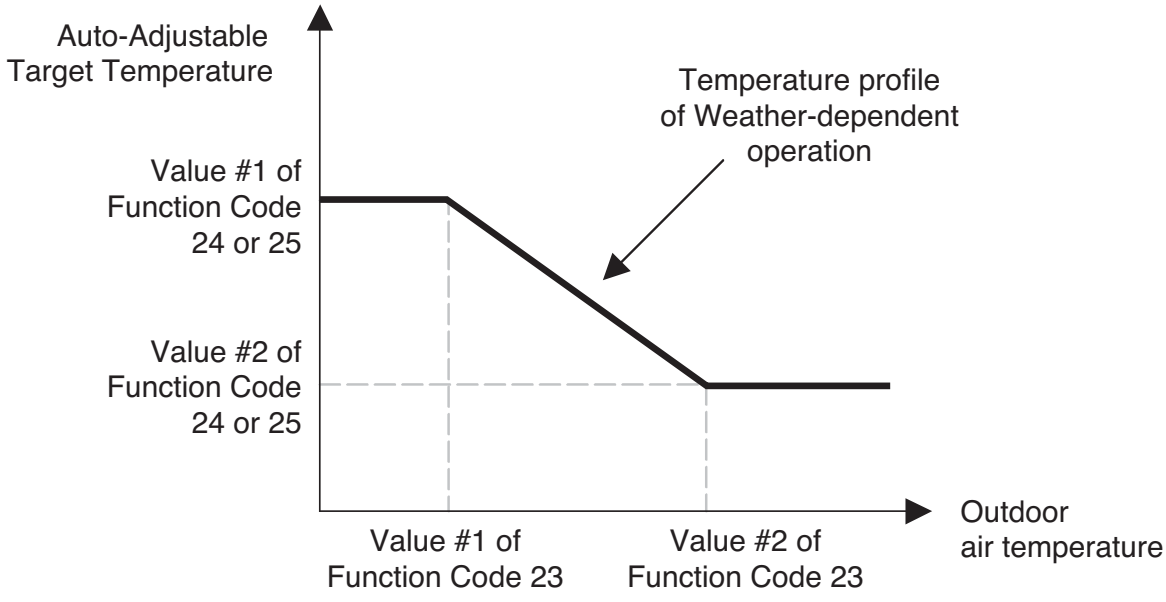
• **Function Code 23, 24, and 25** : Setting weather-dependent operation

Weather-dependent operation is that the product automatically adjusts target temperature (leaving water or room air) according to the outdoor air temperature.

- Value #1 and Value #2 of Function Code 23 : range of outdoor air temperature
- Value #1 and Value #2 of Function Code 24 : range of auto-adjustable target room air temperature
- Value #1 and Value #2 of Function Code 25 : range of auto-adjustable target leaving water temperature

Note : Weather-dependent operation is applied for heating mode only.



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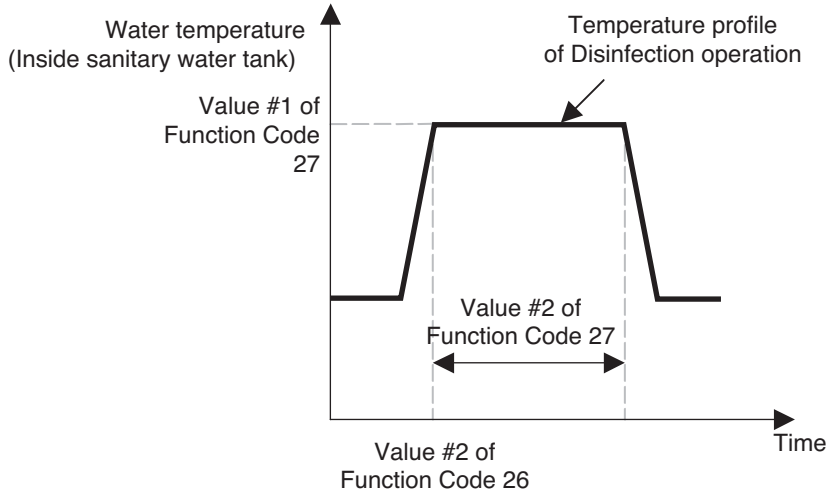
• **Function Code 26 and 27** : Setting disinfection operation

Disinfection operation is special sanitary tank operation mode to kill and to prevent growth of viruses inside the tank.

- Value #1 of Function Code 26 : Selecting enable or disable of disinfection operation. ’00’ for disable, and ’01’ for enable.
- Value #2 of Function Code 26 : Determining the date when the disinfection mode is running. ’01’ for Sunday, ’02’ for Monday, … , and ’07’ for Saturday.
- Value #3 of Function Code 26 : Determining the time when the disinfection mode is running. ’00’ for 0:00am, ’01’ for 01:00am, … , ’22’ for 10:00pm, and ’23’ for 11:00pm.
- Value #1 of Function Code 27 : Target temperature of disinfection mode.
- Value #2 of Function Code 27 : Duration of disinfection mode.



⚠ WARNING

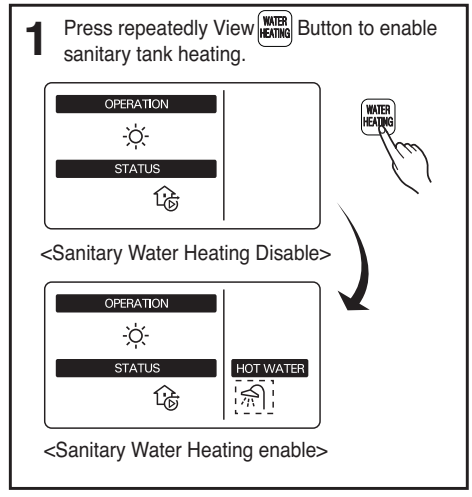
Values of Function Code 26

- If Value #1 of Function Code 26 is set as ’00’, that is ‘disable disinfection mode’, Value #2 and Value #3 is not used.
- When Value #1 is set as ’01’, that is ‘enable disinfection mode’,’ Value #2 is displayed at the position of Value #1 and Value #3 is displayed at the position of Value #2. It is due to limited width of the control panel display.

⚠ CAUTION

Sanitary water heating should be enable

- If sanitary water heating is disable, the disinfection mode will not be operated although Value #1 of Code 26 is set as ’01’.
- To use disinfection mode, sanitary water heating should be enable.



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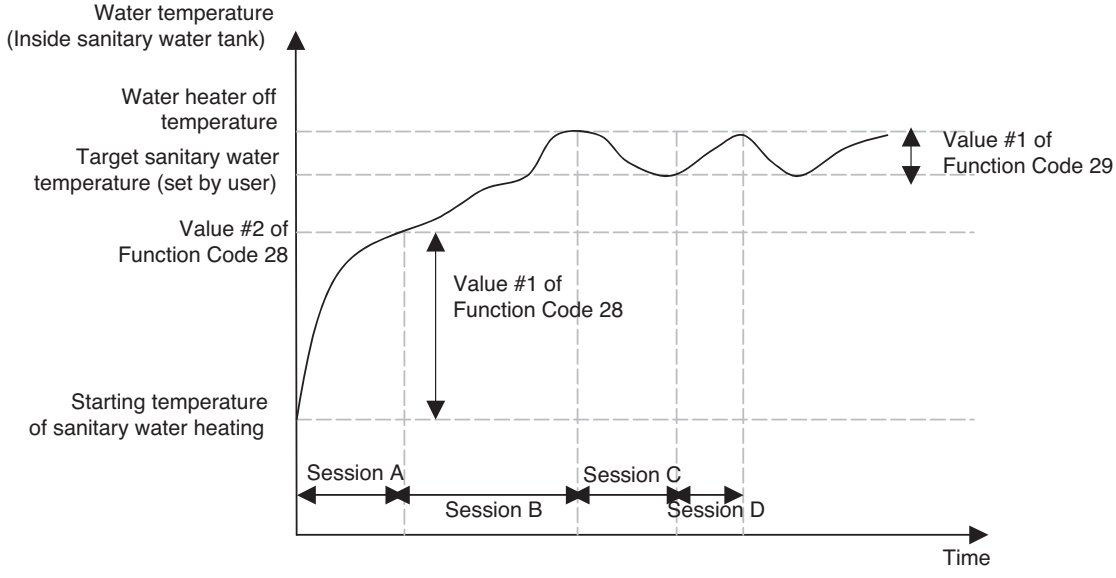
• **Function Code 28 and 29** : Setting control parameter for sanity water heating operation

Descriptions for each parameters are as following.

- Value #1 of Function Code 28 : temperature gap from Value #2 of Function Code 28.
- Value #2 of Function Code 28 : maximum temperature generated by AWHP compressor cycle.
- Example : If Value #1 is set as '5' and Value #2 is set as '48', then Session A (see the graph) will be started when the water tank temperature is below 45 °C …. If temperature is above 48 °C …, then Session B will be started.

- Value #1 of Function Code 29 : temperature gap from target sanitary water temperature. This value is required to frequent On and Off of water tank heater.
- Value #2 of Function Code 29 : Determining heating demand priority between sanitary water tank heating and under floor heating.
- Example : If user's target temperature is set as '70' and Value #1 is set as '3', then the water tank heater will be turned off when the water temperature is above 73 °C. The water tank heater will be turned on when the water temperature is below 70 °C.
- Example : If Value #2 is set as '0', that means heating priority is on sanitary water heating, sanitary water is heated by AWHP compressor cycle and water heater. In this case the under floor can not be heated while sanitary water heating. On the other hand, if the Value #2 is set as '1', that means heating priority is on under floor heating, sanitary tank is ONLY heated by water heater. In this case the under floor heating is not stopped while sanitary water is heated.



Session A : Heating by AWHP compressor cycle and water heater
Session B : Heating by water heater
Session C : No heating (Water heater is Off)
Session D : Heating by water heater

• **Function Code 2A** : Miscellaneous setting

- Value #1 of Function Code 2A : determine electric heater and water heater on and off.
- Value #2 of Function Code 2A : not used.
- Example : If Value #1 is set as '0', then electric heater and water heater are on and off according to control logic. If Value #1 is set as '1', then electric heater is never turned on and only water heater is on and off according to control logic.

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3. Test Run

1. Check before Test Run

1	Check to see whether there is any refrigerant leakage, and check whether the power or transmission cable is connected properly.
2	Confirm that 500 V megger shows 2.0 MΩ or more between power supply terminal block and ground. Do not operate in the case of 2.0 MΩ or less. **NOTE**: Never carry out mega ohm check over terminal control board. Otherwise the control board may break. Immediately after mounting the unit or after leaving it turned off for an extended length of time, the resistance of the insulation between the power supply terminal board and the ground may decrease to approx. 2.0 MΩ as a result of refrigerant accumulation in the internal compressor. If the insulation resistance is less than 2.0 MΩ, turn on the main power supply.

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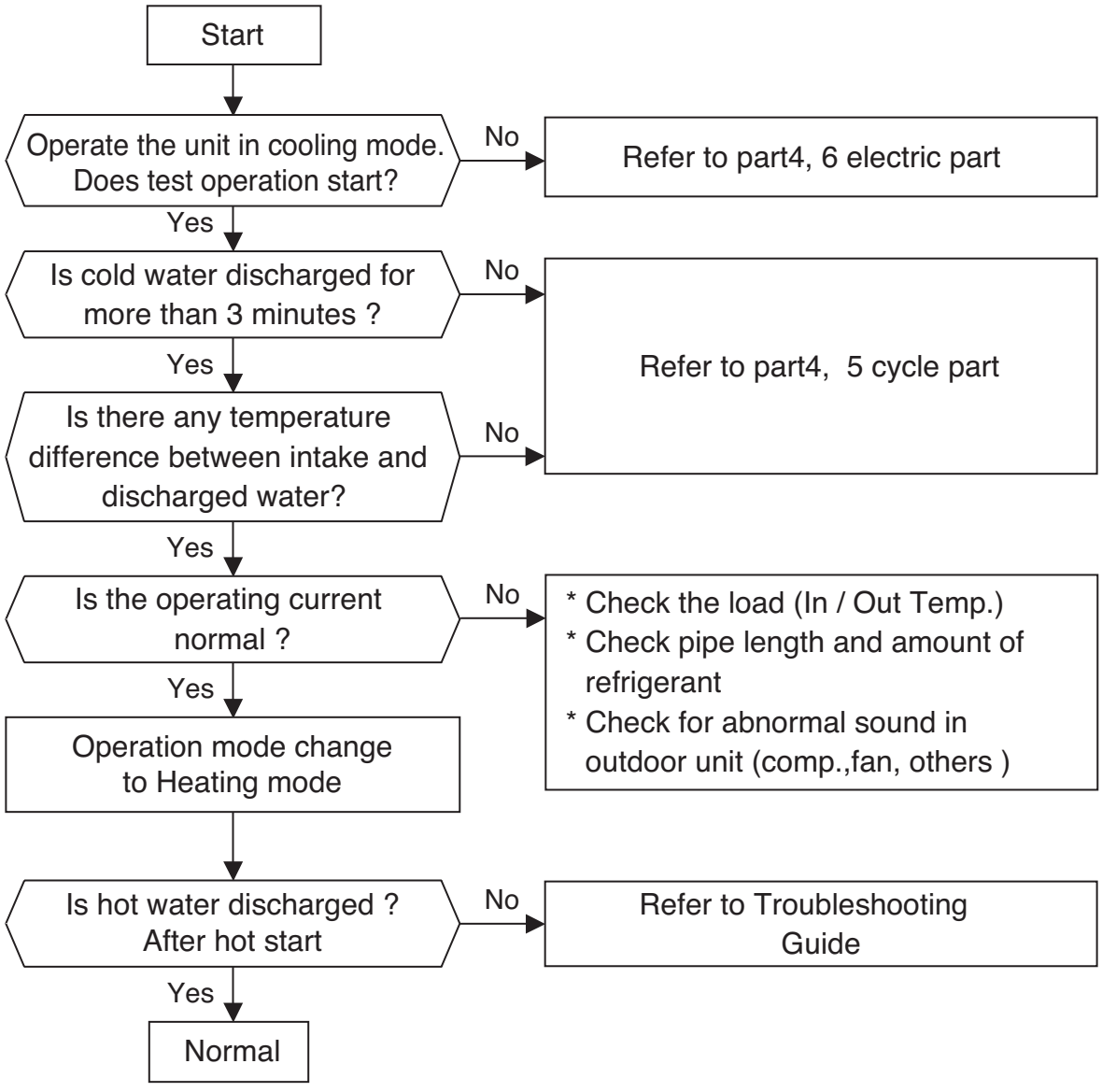
2. Test Run Flow chart


Start
Operate the unit in cooling mode. Does test operation start?
No
Refer to part4, 6 electric part
Yes
Is cold water discharged for more than 3 minutes ?
No
Refer to part4, 5 cycle part
Yes
Is there any temperature difference between intake and discharged water?
No
Yes
Is the operating current normal ?
No
* Check the load (In / Out Temp.)
* Check pipe length and amount of refrigerant
* Check for abnormal sound in outdoor unit (comp.,fan, others)
Yes
Operation mode change to Heating mode
Is hot water discharged ? After hot start
No
Refer to Troubleshooting Guide
Yes
Normal

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Part 3
Replacement

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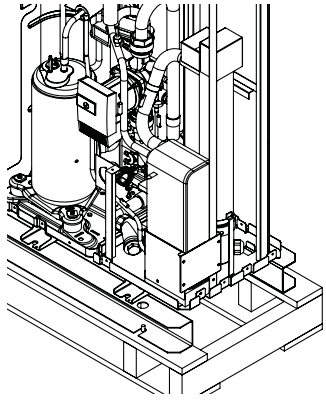
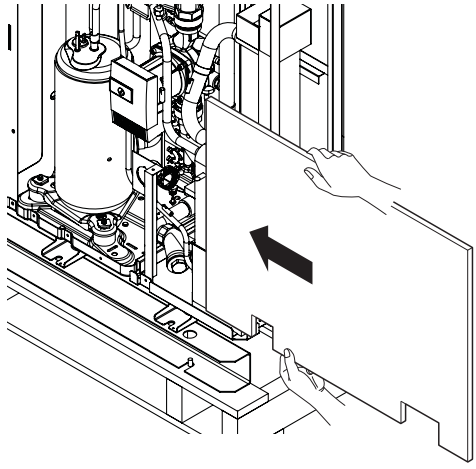
1. Replacement Procedure for Compressor

1. **Remove the sound proof covering the faulty compressor, and disconnect the power**
2. **Disconnect the brazing sections of suction pipe and discharge pipe by using brazing torch after the refrigerant has been pumped out or collected completely.**
3. **Remove three nuts at cushion rubber section to take out the faulty compressor outside the unit. <Figure 1>**
4. **Install the new compressor in the unit. (Be sure to insert the cushion rubbers before tightening the fixing nut of compressor.)**
5. **Remove the rubber caps put on the suction and discharge pipe of the new compressor to release the sealing nitrogen gas.**
6. **Braze the suction and discharge pipe with brazing torch to the compressor.**
7. **Conduct air tight test to check the piping system is free from leakage.**
8. **Connect power cable to the terminal board of compressor and cover the compressor with sound proof. <Figure 2>**
9. **Conduct vacuum.**
10. **After completion of vacuum, open the service valves. If recovery unit is used, charge refrigerant.**

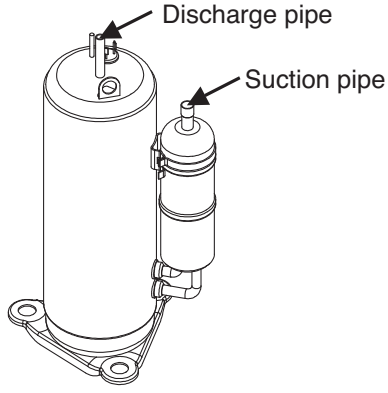


< Figure 1 >



When inserting the sound proof, be sure to insert counter-clockwise.

< Figure 2 >



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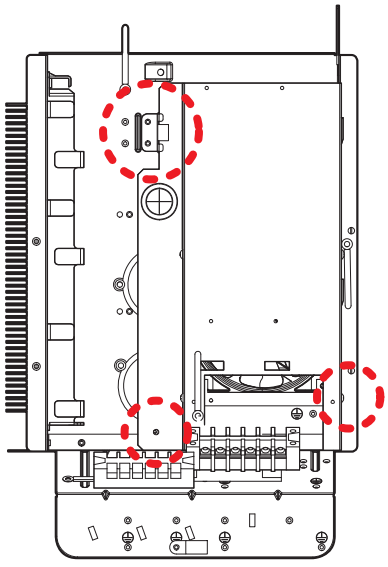
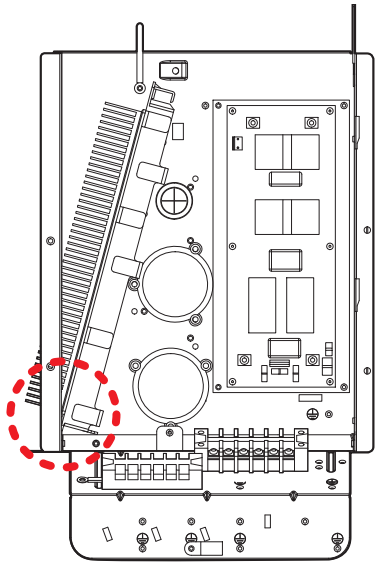
2. Replacement Procedure for INV PCB

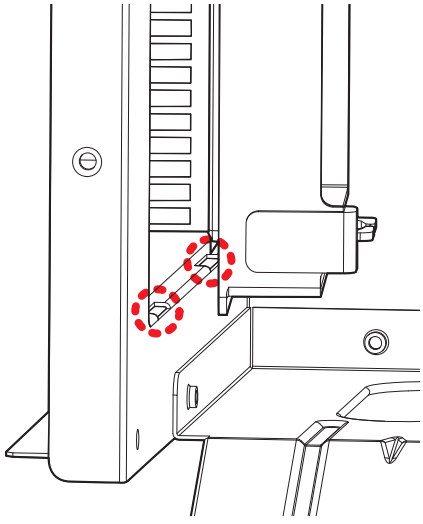
1. Disassemble panel assembly by unscrewing 4 screws. (Figure 1.)
2. Replace INV PCB assembly. (Figure 2.)
   When assemble INV PCB assembly with control case, make sure that PCB case is inserted surely in the slit of control case.
3. Assemble panel assembly and main PCB.



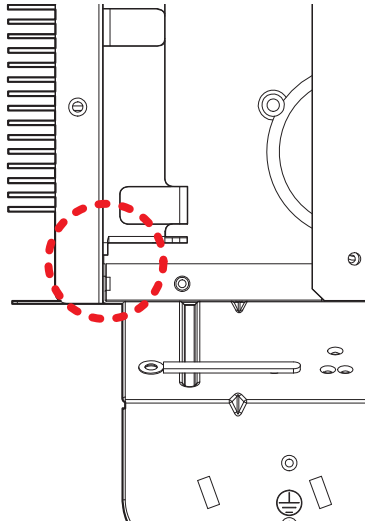
< Figure 1. >



< Figure 2. >



< Figure 3. >



< Figure 4. >

CAUTION

Be sure that INV PCB assembly is firmly assembled with control case.
Confirm that there is no gap between INV PCB case and control case. (Figure 4.)
If any gap is present, it will cause product malfunction.

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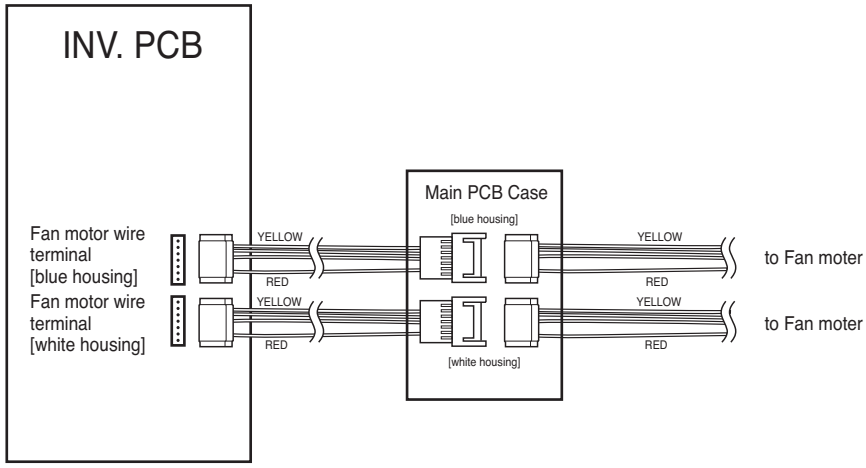
CAUTION

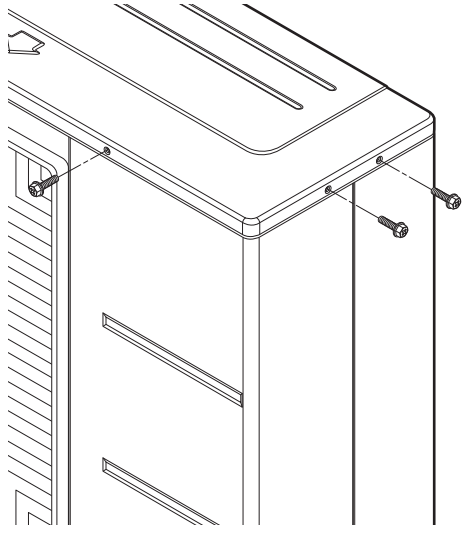
After replace the INV PCB assembly, make sure that connection of fan motor wires is correct.



If the connection between wires is incorrect, performance of the unit would be decreased.

3. Caution for Assembling Outdoor Panels after Test Run

When assemble the outdoor panels after replacement, make sure that screws of top panel are assembled as shown figure below. If screws are not assembled, it allows rain come into control box causing defect of unit.



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Part 4
Trouble Shooting

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Trouble Shooting

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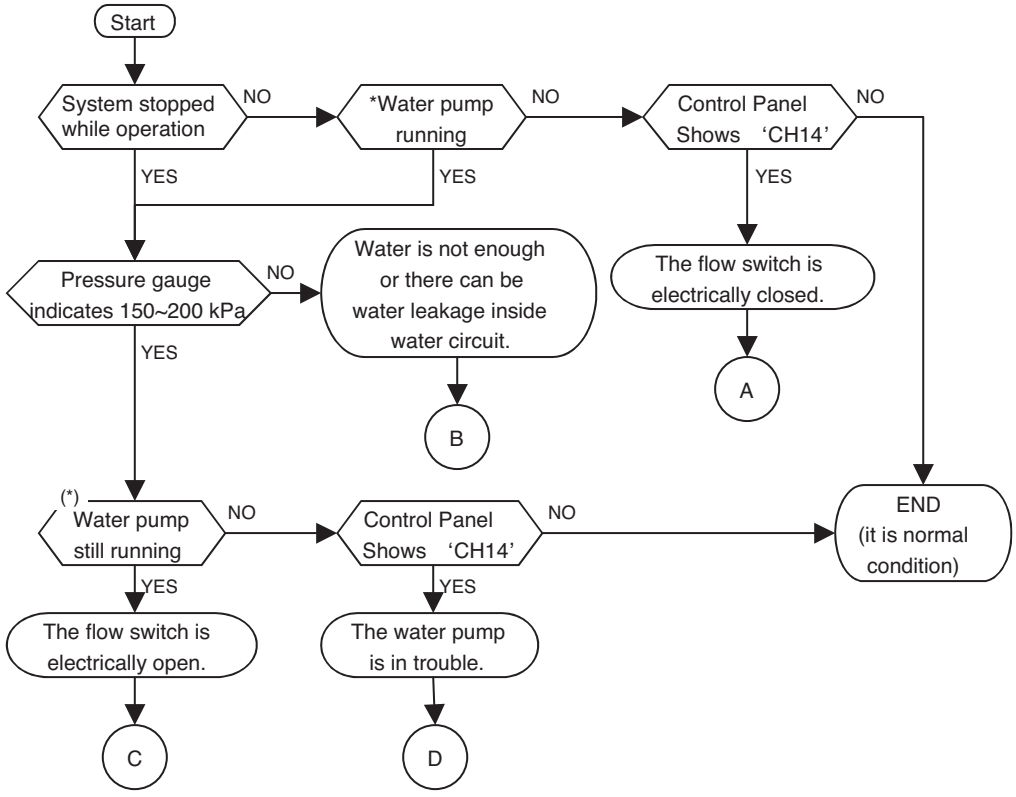
1. Checking Key Components of Unit

1.1 Flow Switch



*: How to identify? - Touch the terminal box (black plastic box at the water pump) of water pump and feel if the water pump is vibrating. If no vibration, the water pump is not operating. Also, you can see 'Water Pump Operating Icon( ) ' at control panel.

A
- Although there is not water flow inside water circuit, the flow switch detects as if water is flowing. It is due to electrically closed (or short) of flow switch or the contact of flow switch is mechanically stuck.
- Contact official After Service Center and replace the flow switch.
- Check the air vent. If there is air in the unit, it can display "CH14". Please remove the air by using the air vent.

B
- Check if water inside water circuit is fully charged. Pressure gauge at the unit should indicate 150~200 kPa.
- Also, as the hand of the pressure gauge is not react so fast according to water charging, check the pressure gauge again.
- Otherwise, there can be water leakage inside water circuit. Examine if water circuit is completely sealed.

C
- Although water is well flowing, the flow switch can not detect water flow. It is due to electrically open of flow switch or the contact of flow switch is mechanically broken.
- Contact official After Service Center and replace the flow switch.

D
- Read 'Checking Key Components of Unit – Water Pump' carefully to get more detail information.
- Contact official After Service Center and replace the water pump.
- Also, check the water quality if there are particles that can yield locking at the shaft of the water pump.
- Check the air vent. If there is air in the unit, it can display "CH14". Please remove the air by using the air vent.

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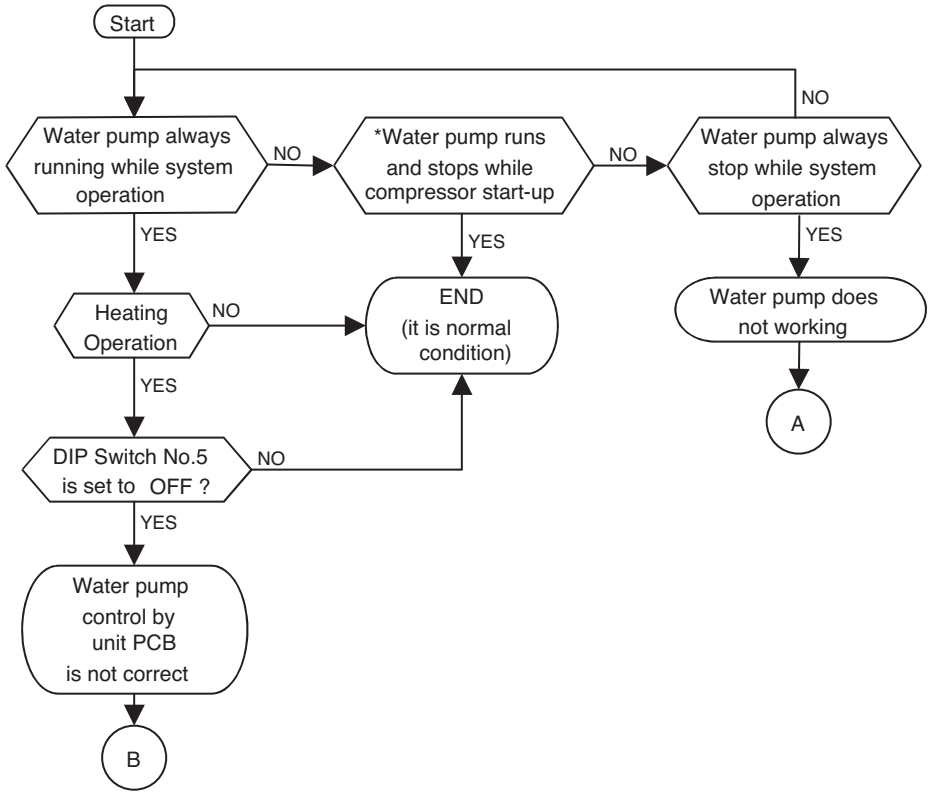
1.2 Water Pump



* : It is normal condition that water pump runs or stops during system operation (including compressor start-up) due to specific control logic.

A

- Water pump does not because of mechanical defects of water pump or wrong wiring at the water pump.
- To correct mechanical defects, contact official After Service Center and replace the water pump.
- To correct wrong wiring, check if wires 'CN_W/PUMP (A)' connector on the unit PCB and water pump terminal box (black plastic box at the water pump) are connected firmly. Also, check wires are electrically connected by measuring resistance of each wires (if electrically connected exactly, resistance should be 0 ohm).

B

- Unit PCB can not make control signal or wrong wiring at the water pump.
- To correct unit PCB's making control signal, first check the signal level. Use electric voltage meter and measure voltage at 'CN_W/PUMP (A)' connector on the unit PCB. If measured value is not 220 V ~ 240 V AC while 'Water Pump Operating Icon ( )' is displayed at control panel, the unit PCB is in trouble. In this case, contact official After Service Center and replace the unit PCB.
- To correct wrong wiring, please refer Ⓐ.

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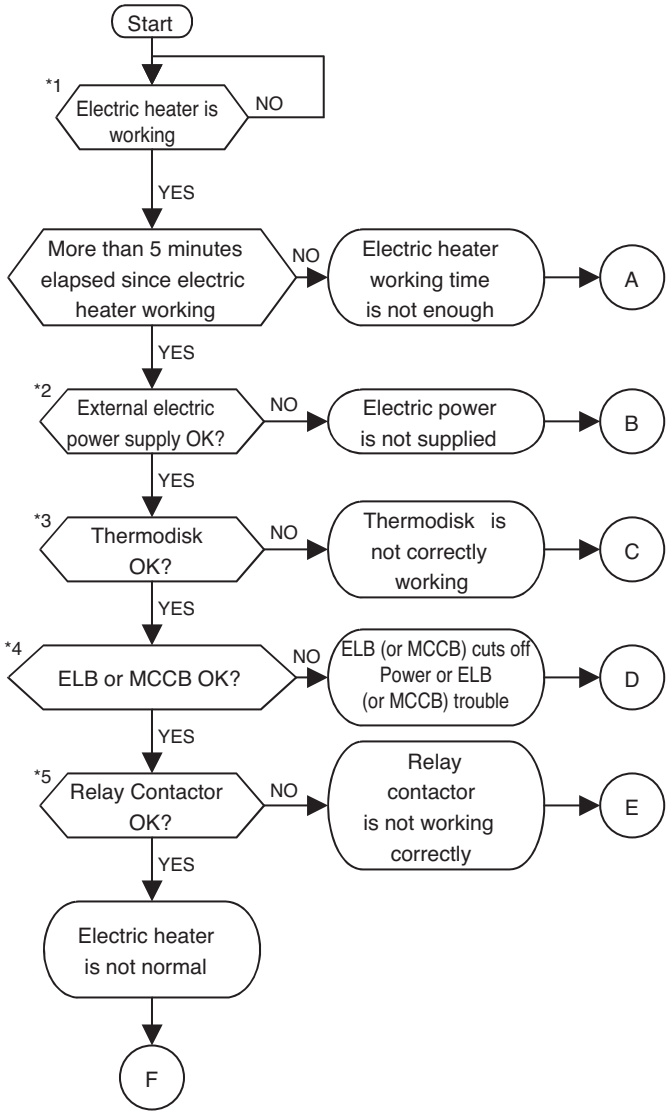
1.3 Electric Heater



*1 : When electric heater is working, 'Electric Heater Operating Icon (~W1 or ~W2)' is displayed at control panel

*2 : For single-phase model : Measure electric voltage at port 3 (Live) and port 4 (Neutral) of Terminal Block 3 with voltage meter. The measured value should be 220 V~240 V AC. To identify the location of Terminal Block 3, please refer circuit diagram of unit at 'Installation Manual' or backside of front cover of the unit.

*2 : For three-phase model : Measure electric voltage at two port of 3 (R), 4 (S), and 5 (T) of Terminal Block 3 with voltage meter. The measured value should be 220 V~240 V AC or 380 V~415 V AC. To identify the location of Terminal Block 3, please refer circuit diagram of unit at 'Installation Manual' or backside of front cover of the unit.

*3 : For single-phase model : Find cover of thermodisk which is located beside air vent. Air vent is on the top of the electric heater tank. Uncover the cover by unscrewing bolts. Find two copper leads located both left and right side of the thermodisk core. Check resistance of both leads. The measured resistance should be 0 ohm. After then, check if voltage is transmitted to the thermodisk correctly. Measure electric voltage between one of the lead (Live) of the thermodisk and port 3 (Neutral) of ELB (A). The measured value should be 220 V~240 V AC.

*3 : For three-phase model : Find cover of thermodisk which is located side of electric heater tank.Uncover the cover by unscrewing bolts. Find two copper leads located both left and right side of two thermodisk core. Check resistance of both leads of each thermodisks. The measured resistance should be 0 ohm.

While uncovering the cover of the thermodisk, be careful for electric shock.

*4 : For single-phase model : Resistance between port 1 and port 2 should be 0 ohm. Also, port 3 and port 4 should be 0 ohm, too. Finally, measure electric voltage at port 2 (Live) and port 4 (Neutral) with voltage meter. The measured value should be 220V~240V AC.

*4 : For three-phase model : Resistance between port 1-to-port 2, port 3-to-port 4, and port 5-to-port 6 of MCCB (A) should be 0 ohm. Port number and location of MCCB (A) can be found circuit diagram of the unit(back side of front cover).

*5 : For single-phase model : At Relay Contactor (A), measure electric voltage at port 2 (Live) and port 6 (Neutral) with voltage meter. The measured value should be 220V~240V AC. Also, at Relay Contactor (B), measure electric voltage at port 2 (Live) and port 6 (Neutral) with voltage meter. The measured value should be 220V~240V AC.

*5 : For three-phase model : At Magnet Contact (C) or Magnet Contact (B), resistance between port L1-to-port T1, port L2-to-port T2, and port L3-to-port T3 should be 0 ohm.

A
- Wait for 5 minutes to heat water inside electric heater tank. If capacity of electric heater is 6kW, at least 2 centigrade will be increased.

B
- For single-phase model : Check if external electricity power supply is breakout. If not, check wiring between external electricity power supply and port 3 and port 4 of Terminal Block 3. You can identify the location of Terminal Block 3 at the circuit diagram of unit.
- For three-phase model : Check if external electricity power supply is breakout. If not, check wiring between external electricity power supply and port 3, port 4, and port 5 of Terminal Block 3. You can identify the location of Terminal Block 3 at the circuit diagram of unit.

C
- Thermodisk is mechanically defected. In this case, contact official After Service Center and replace the thermodisk.

D
- Check the insulation resistance of Electric Heater.
- If the insulation resistance has improper, remove the cause of the problem and then reset the ELB (or MCCB).
- Replace the ELB (or MCCB) when the insulation resistance is suitable.

E
- Relay contactor is is mechanically defected. In this case, contact official After Service Center and replace the relay contactor.

F
- Heating coil of electric heater can be damaged or wiring inside the electric heater is problem. Before replacing the electric heater, in this case, contact official After Service Center and do diagnosis about electric heater and related parts including the capacity of external electric power source. If the reason of malfunction is clearly proved as the defect of the electric heater itself, then replace it with new one.

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1.4 Remote Controller

To solve various troubles while using control panel, please read following FAQ (Frequently Asked Questions).
For your convenience, all questions are classified according to topics.

No	Topic	Question	Answer
1	Power button does not bright	System installation is finished. Also, all wirings including power connection is all right. But when the power button in front of the control panel is pushed, it does not bright.	• There can be a problem in wiring between PCB and control panel. Open control box and find 'CN_REMO' connector at the PCB. If the connector is empty or nothing is connected, please connect it with end of wire which is from control panel then restart the system. • Check if external controller is connected like thermostat. If thermostat is connected to the system and it is configured exactly, you can see 'Thermostat Icon ( )' at the display of the control panel. It is normal condition that power button of control panel does not work when thermostat is installed.
2	Some icons are displayed automatically	Although nobody touched control panel, someties it displays specific icons and the system operates automatically.	• It is normal condition. Basically, two features can be operated without user's decision – one is system protective operation, the other is 'background water tank heating operation', which is heating inside the water tank while space heating is not used or the system is not working. System protective operation is, as letter says, for the purpose of securing the system from worse condition. Anti-freezing operation, for example, is one of the protective operation. It is essential to start protective operation to prevent potential malfunction and to keep possible accidents. On the other hand, background water tank heating operation is not protective operation but to supply warm water to end-user. The background water tank heating operation is only started when the water tank temperature is under the specific temperature.
3	Water tank heating or related features are not permitted	Setting water tank temperature is not permitted although the water tank is installed.	Following two conditions should be satisfied. • Check if 'Water tank enable/disable' button is correctly pushed or not. To use water tank, end-user must push button and highlight icon. Otherwise, water tank heating is disabled. • Also, check if DIP switch setting is correct or not. To identify the DIP switch setting, open the control box inside the unit. Unless 2nd and 3rd pin of DIP switch setting is 01(OFF-ON) or 10(ON-OFF), the water tank heating will not be configured.

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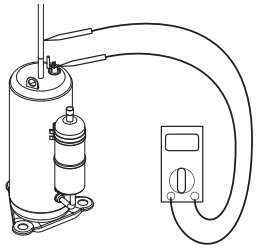
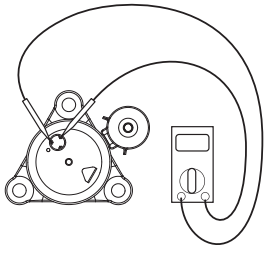
1.5 Compressor

Check and ensure in following order when error related with the compressor or error related with power occurs during operation:

<table>
<tr><th>No.</th><th>Checking Item</th><th>Symptom</th><th>Countermeasure</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Is how long power on during operation?</td><td>1) Power on for 12 hours or more</td><td>• Go to No.2.</td></tr>
<tr><td>2) Power on for 12 hours or less</td><td>• Go to No.2 after applying power for designated time (12 hours).</td></tr>
<tr><td rowspan="3">2</td><td>Does failure appears again when starting operation?</td><td>1) The compressor stops andsame error appears again.</td><td>• Check IPM may fail.</td></tr>
<tr><td>Method to measure insulation resistance
 
Method to measure coil resistance
  </td><td>2) If output voltage of the inverter is stable.</td><td>• Check coil resistor and insulation resistor. If normal, restart the unit. If same symptom occurs, replace the compressor.
• Insulation resistor: 2 MΩ or more
• Coil resistor:
at 25 °C
<table><tr><th></th><th>Inverter (NPT525DAA)</th></tr><tr><td>U-V</td><td>1.183</td></tr><tr><td>U-W</td><td>1.174</td></tr><tr><td>V-W</td><td>1.181</td></tr></table></td></tr>
<tr><td>3) If output voltage of the inverter is unstable or it is 0 V.
(When incapable of using a digital tester)</td><td>• Check the IPM.
If the IPM is normal, replace the inverter board.
• Check coil resistor and insulation resistor.</td></tr>
</table>

[Cautions when measuring voltage and current of inverter power circuit]

Measuring values may be different depending on measuring tools and measuring circuits since voltage, current in the power supply or output side of the inverter has no same waveform.
Especially, output voltage changes when output voltage of the inverter has a pattern of pulse wave.
In addition, measuring values appear largely different depending on measuring tools.

Note

1) If using a portable tester when checking the output voltage of the inverter is constant (when comparing relative voltage between lines), always use an analog tester. Especially exercise particular caution if the output frequency of the inverter is low, when using a movable tester, where change of measured voltage values is large between other lines, when virtually same values appear actually or where there is danger to determine that failure of the inverter occurred.
2) You can use rectification voltmeter (⊣▶⊢) if using commercial frequency tester when measuring output values of the inverter (when measuring absolute values). Accurate measuring values cannot be obtained with a general portaable tester (For analog and digital mode).

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1.6 Fan Motor

Checking Item	Symptom	Countermeasure
(1) The fan motor does not operate. Does failure appears again when starting operation? (2) Vibration of the fan motor is large.	1) When power supply is abnormal	• Modify connection status in front of or at the rear of the breaker, or if the power terminal console is at frosting condition.
		• Modify the power supply voltage is beyond specified scope.
	2) For wrong wiring	• For following wiring. 1. Check connection status. 2. Check contact of the connector. 3. Check that parts are firmly secured by tightening screws. 4. Check connection of polarity. 5. Check short circuit and grounding.
	3) For failure of motor	• Measure winding resistance of the motor coils.
	4) For failure of circuit board	Replace the circuit board in following procedures if problems occur again when powering on and if there are no matters equivalent to items as specified in above 1) through 4). (Carefully check both connector and grounding wires when replacing the circuit board.) 1. Replace only fan control boards. If starting is done, it means that the fan control board has defect. 2. Replace both fan control board and the main board. If starting is done, it means that the main board has defect. 3. If problems continue to occur even after countermeasure of No.1 and No.2, it means that both boards has defect.

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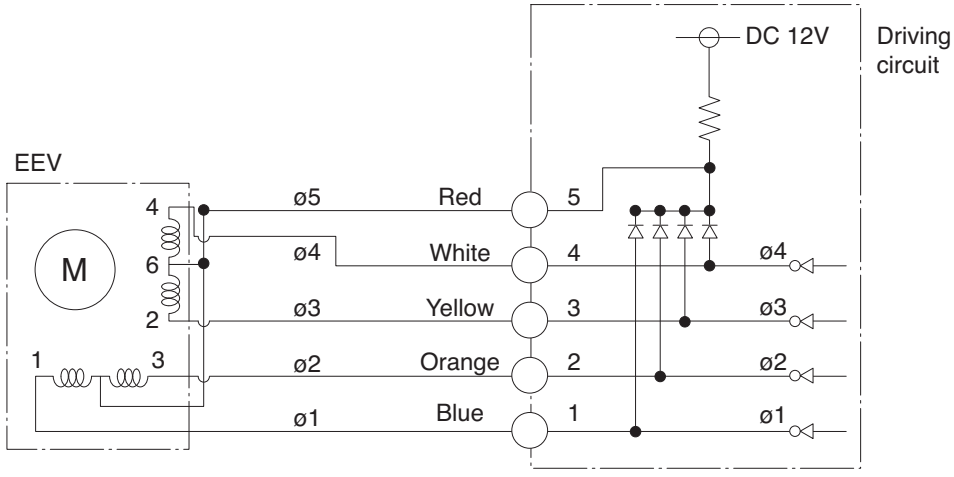
1.7 Electronic Expansion Valve



• Pulse signal output value and valve operation

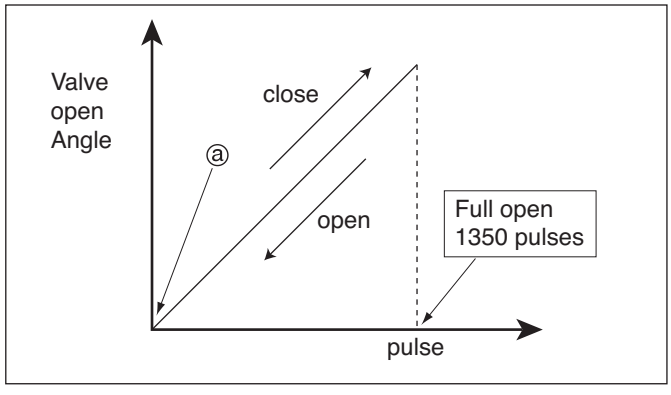
Output(ø) No.	Output state							
	1	2	3	4	5	6	7	8
ø1	ON	OFF	OFF	OFF	OFF	OFF	ON	ON
ø2	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
ø3	OFF	OFF	ON	ON	ON	OFF	OFF	OFF
ø4	OFF	OFF	OFF	OFF	ON	ON	ON	OFF

• Output pulse sequence

- In valve close state: 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 1
- In valve open state: 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1 → 8

1. If EEV open angle does not change, all of output phase will be OFF
2. If output phase is different or continuously in the ON state, motor will not operate smoothly and start vibrating.

• EEV valve operation



- At power ON, open angle signal of 1400 pulses output and valve position is set to ⓐ
  If valve operates smoothly, no noise and vibration occur and if valve is closed. noise occurs.
- Noise from EEV can be confirmed by touching the EEV surface with a screw driver and listening the EEV noise.
- If liquid refrigerant is in EEV, the noise is lower.

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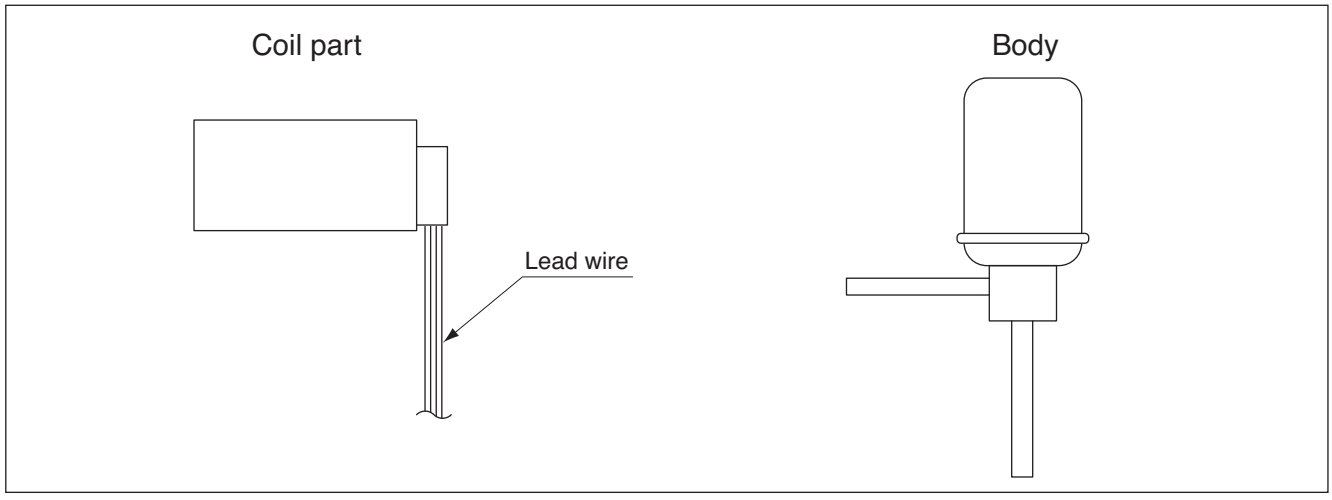
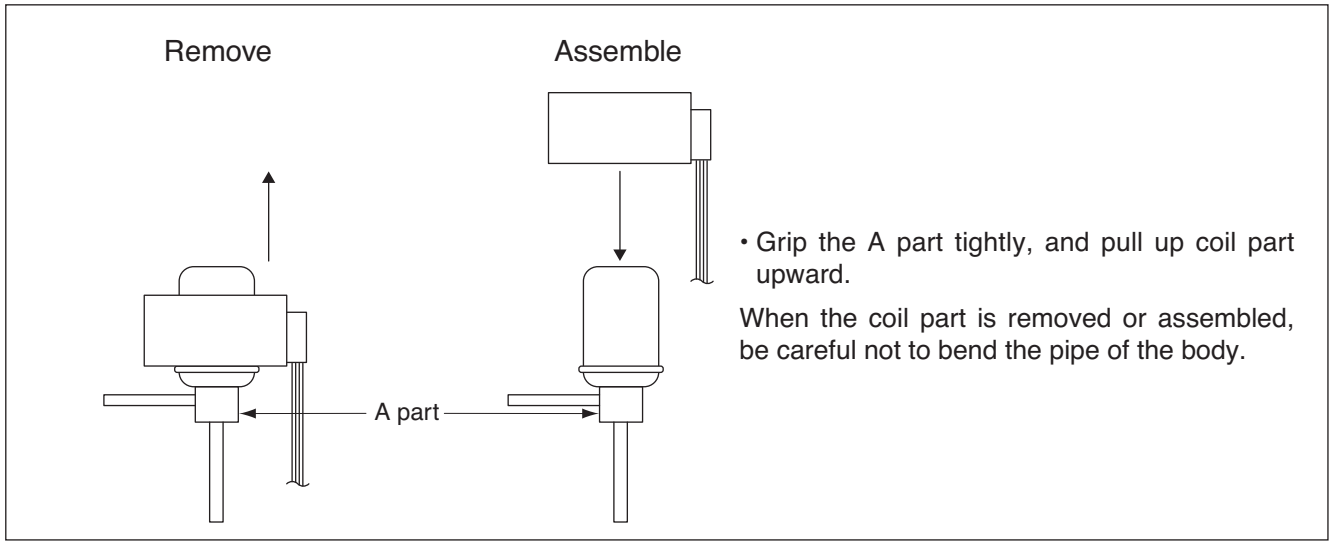
• EEV coil and body (Outdoor unit)

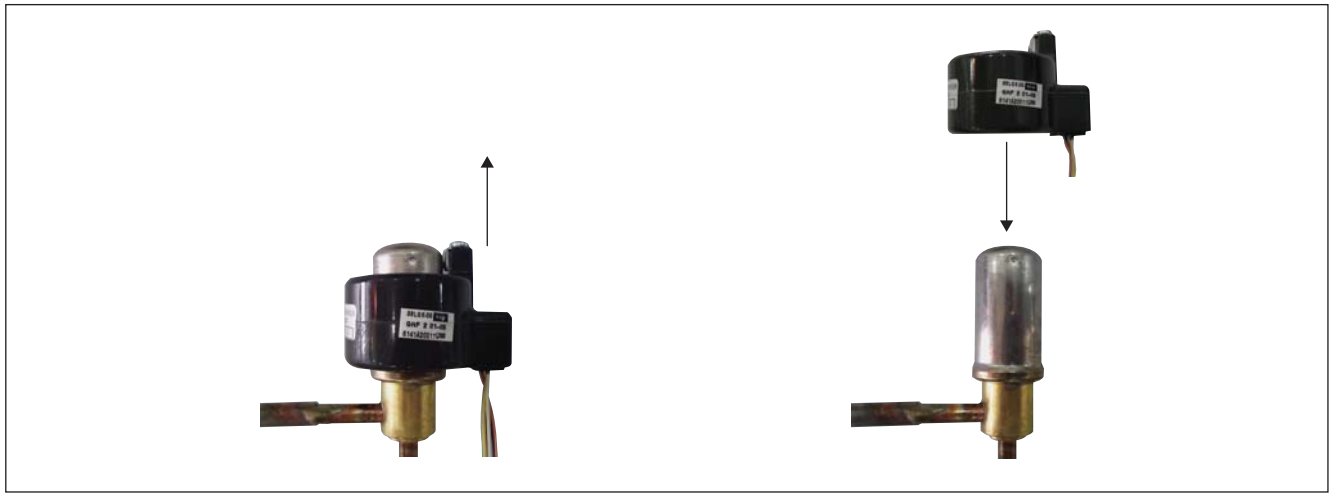


• Remove and assemble the coil



• Grip the A part tightly, and pull up coil part upward.

When the coil part is removed or assembled, be careful not to bend the pipe of the body.



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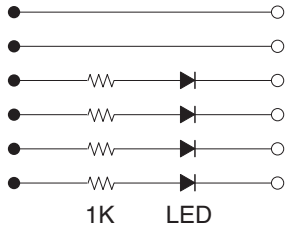
- **EEV failure check method**

Failure mode	Diagnosis	Repair process	Remark
Microcomputer Driving circuit failure	1.Disconnect the EEV connector form control board and connect testing LED  2. Main power ON, pulse signal is out from EEV for 17 sec. If LEDs do not turn on, or are in on state continuously, then driving circuit is abnormal	Check and replace unit control board	unit
EEV locking	1.If EEV is locked, in no load state, the driving motor rotate, and clicking sound always occurs	Replace EEV	
EEV Motor coil short or misconnection	1. Check the resistance between coil terminal (red-white, red-yellow, red-orange, red-blue) 2. If the estimated resistance value is in 52 ± 3 Ω then the EEV is normal	Replace EEV	
	1. Check the resistance between coil terminal (brown-white, brown-yellow, brown-orange, brown-blue) 2. If the estimated resistance value is in 150 ± 10 Ω then the EEV is normal	Replace EEV	

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2. Self-Diagnosis Feature

2.1 Concept of 'Classified Trouble'

• **Definition of terms**

- Trouble : a problem which can stop system operation, and can be resumed temporarily under limited operation without certificated professional's assist.
- Error : a problem which can stop system operation, and can be resumed ONLY after certificated professional's check.
- Emergency mode : temporary heating operation while system met Trouble

• **Objective of introducing 'Trouble'**

- Not like airconditioning product, Air-to-Water heat pump is generally operating in whole winter season without any system stopping.
- If system found some problem, which is not critical to system operating for yielding heating energy, the system can temporarily continue operating in emergency mode with enduser's decision.

• **Classified trouble**

- Trouble is classified two levels according to the seriousness of the problem : Slight trouble and heavy trouble
- Slight trouble : In most case, this trouble is concerned with sensor problems. The outdoor unit is operating under emergency mode operation condition which is configured by DIP switch No. 4 of the Main PCB Assembly 1.
- Heavy trouble : As the outdoor unit has problem, the emergency mode operation is performed by electric heater.
- Option trouble : a problem is found for option operation such as water tank heating. In this trouble, the troubled option is assumed as if it is not installed at the system.

• **Emergency operation is not automatically restarted after main electricity power is reset.**

- In normal condition, the product operating information is restored and automatically restarted after main electricity power is reset.
- But in emergency operation, automatic re-start is prohibited to protect the product.
- Therefore, user must restart the product after power reset when emergency operation has been running.

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2.2 Error Code List

Code No.	Description	Classification				Unit
		Slight Trouble	Heavy Trouble	Option Trouble	Error	
01	Problem in Remote Room Air sensor	O				Indoor
02	Problem in Refrigerant (Inlet side) sensor		O			Indoor
03	Bad communication between control panel and indoor unit				O	Indoor
05	Bad communication between Indoor unit and Outdoor unit				O	Indoor / Outdoor
06	Problem in Refrigerant (Outlet side) sensor		O			Indoor
08	Problem in Water Tank sensor			O		Water Tank
09	PCB Program (EEPROM) Fault				O	Indoor
13	Problem in Solar-thermal sensor			O		Indoor
14	Problem in Flow Switch				O	Indoor
15	Water pipe overheated				O	Indoor
16	Problems in sensors				O	Indoor
17	Problem in Water-inlet sensor	O				Indoor
18	Problem in Water-outlet sensor	O				Indoor
19	Problem in Water-interlim sensor	O				Indoor
20	Electric heater overheated				O	Indoor

• **Notice of error code**

- Slight / Heavy / Option Troubles : lowercases ‘ch’ + code no.
- Errors : capital letters ‘CH’ + code no.

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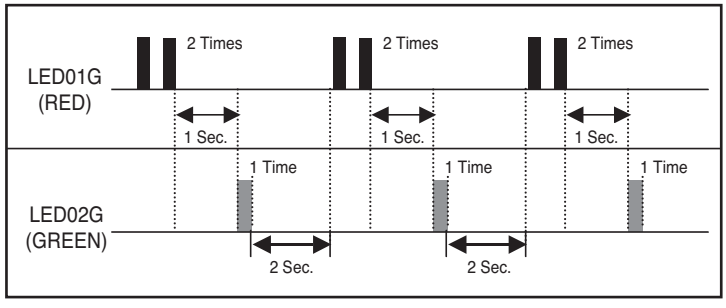
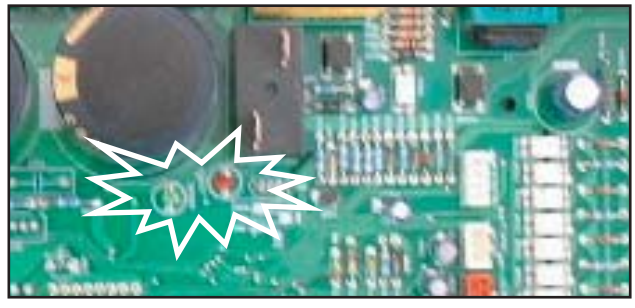
Code No.	Description	Classification				Unit	LED Blinking	
		Slight Trouble	Heavy Trouble	Option Trouble	Error		LED1 (Red)	LED2 Green)
21	DC Peak (IPM Fault)		O			Outdoor	2 times	1 time
22	CT 2 (Max CT)		O			Outdoor		2 times
23	DC Link Voltage is low		O			Outdoor		3 times
24	High Pressure / Low Pressure switch activated		O			Outdoor		4 times
25	Voltage is too low or too high		O			Outdoor		5 times
26	Problem in DC Compressor positioning		O			Outdoor		6 times
27	PSC Fault		O			Outdoor		7 times
28	DC Link Voltage is high		O			Outdoor		8 times
29	High current at Compressor phases		O			Outdoor		9 times
32	Temperature at discharge-pipe is too high		O			Outdoor	3 times	2 times
37	The pressure ratio is too high		O			Outdoor		7 times
40	Problem in CT sensor		O			Outdoor	4 times	none
41	Problem in discharge-pipe temperature sensor		O			Outdoor		1 time
44	Problem in ambient temperature sensor		O			Outdoor		4 times
45	Problem in condenser-pipe temperature sensor		O			Outdoor		5 times
46	Problem in suction-pipe temperature sensor		O			Outdoor		6 times
52	Bad communication between internal PCBs		O			Outdoor	5 times	2 times
53	Bad communication between unit and Outdoor unit		O			Outdoor		3 times
60	EEPROM Checksum mismatched		O			Outdoor	6 times	none
61	Temperature at condenser-pipe is too high		O			Outdoor		1 time
62	Temperature at heatsink is too high		O			Outdoor		2 times
63	Temperature at condenser-pipe is too low		O			Outdoor		3 times
65	Problem in heatsink temperature sensor		O			Outdoor		5 times
73	Instant over current input		O			Outdoor	7 times	3 times

Error indicator (outdoor PCB)

Outdoor unit error
Ex) Error 21 (DC Peack)





CAUTION

Precaution in service or check

Even after stopping the operation of product, it takes some time to discharge the remaining electricity of the electrolytic capacitor that was charged early. Before conducting a checking or repairing job, pull out the plug out of the outlet and make sure that the lamp on the control board outdoor unit is off.

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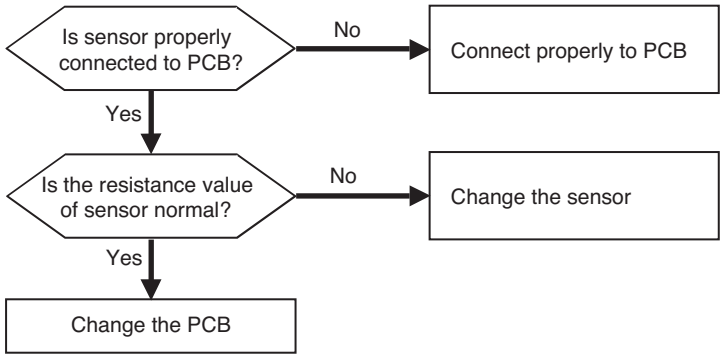
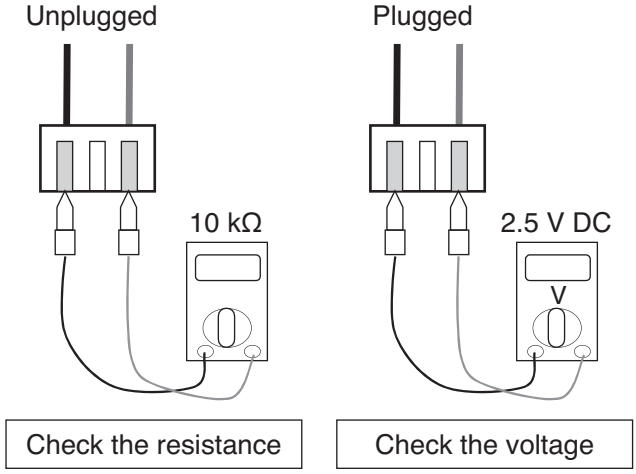
3. Trouble Shooting Guide

Display code	Description	Cause	Normal Condition
01	Problem in Remote Room Air sensor	• Incorrect connection between sensor and PCB • PCB fault • Sensor fault	• Resistance: 10kΩ ohm at 25 centigrade (unplugged) → for Remote Room Air sensor • Resistance: 5kΩ ohm at 25 centigrade (unplugged) → for all sensors EXCEPT Remote Room Air sensor • Voltage: 2.5 V DC at 25 centigrade (plugged) (for all sensors) • Refer resistance-temperature table to check in different temperature
02	Problem in Refrigerant (Inlet side) sensor		
06	Problem in Refrigerant (Outlet side) sensor		
08	Problem in Water Tank sensor		
13	Problem in Solar-thermal sensor		
16	Problems in sensors		
17	Problem in Water-inlet sensor		
18	Problem in Water-outlet sensor		
19	Problem in Water-interlim sensor		

■ Error diagnosis and countermeasure flow chart





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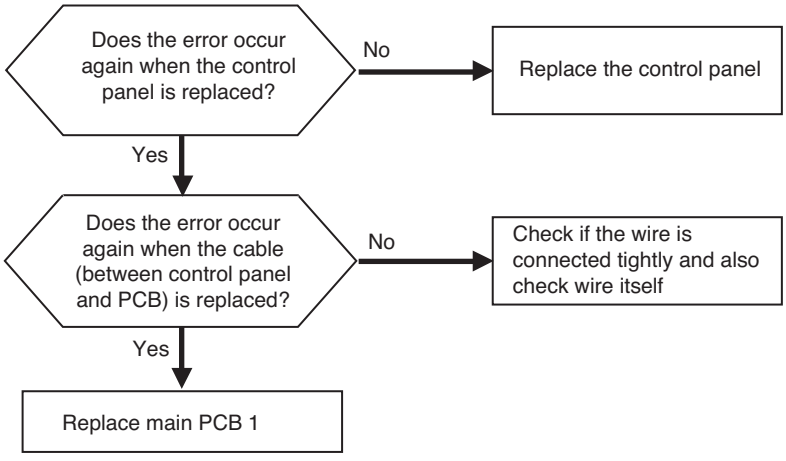
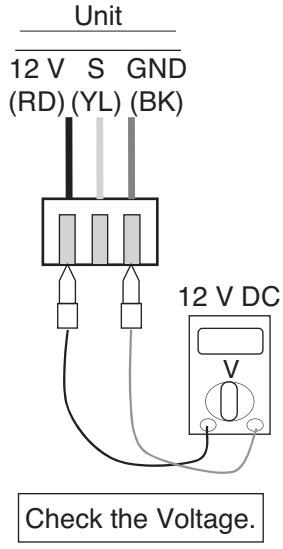
Code No.	Description	Cause	Normal Condition
03	Bad communication between control panel and indoor uni	• Incorrect connection between sensor and PCB • PCB fault • Sensor fault	• Wire connection between control panel and main PCB 1 should be tight • Output voltage of PCB should be 12 V DC

■ Error diagnosis and countermeasure flow chart


Does the error occur again when the control panel is replaced?
No
Replace the control panel
Yes
Does the error occur again when the cable (between control panel and PCB) is replaced?
No
Check if the wire is connected tightly and also check wire itself
Yes
Replace main PCB 1



After replacing the control panel or main PCB 1, it is very important to perform parameter setting by 'entering Installer Setting Mode' at the control panel.
If not, system will NOT be operated correctly. It is STRONGLY recommended to keep above instruction.

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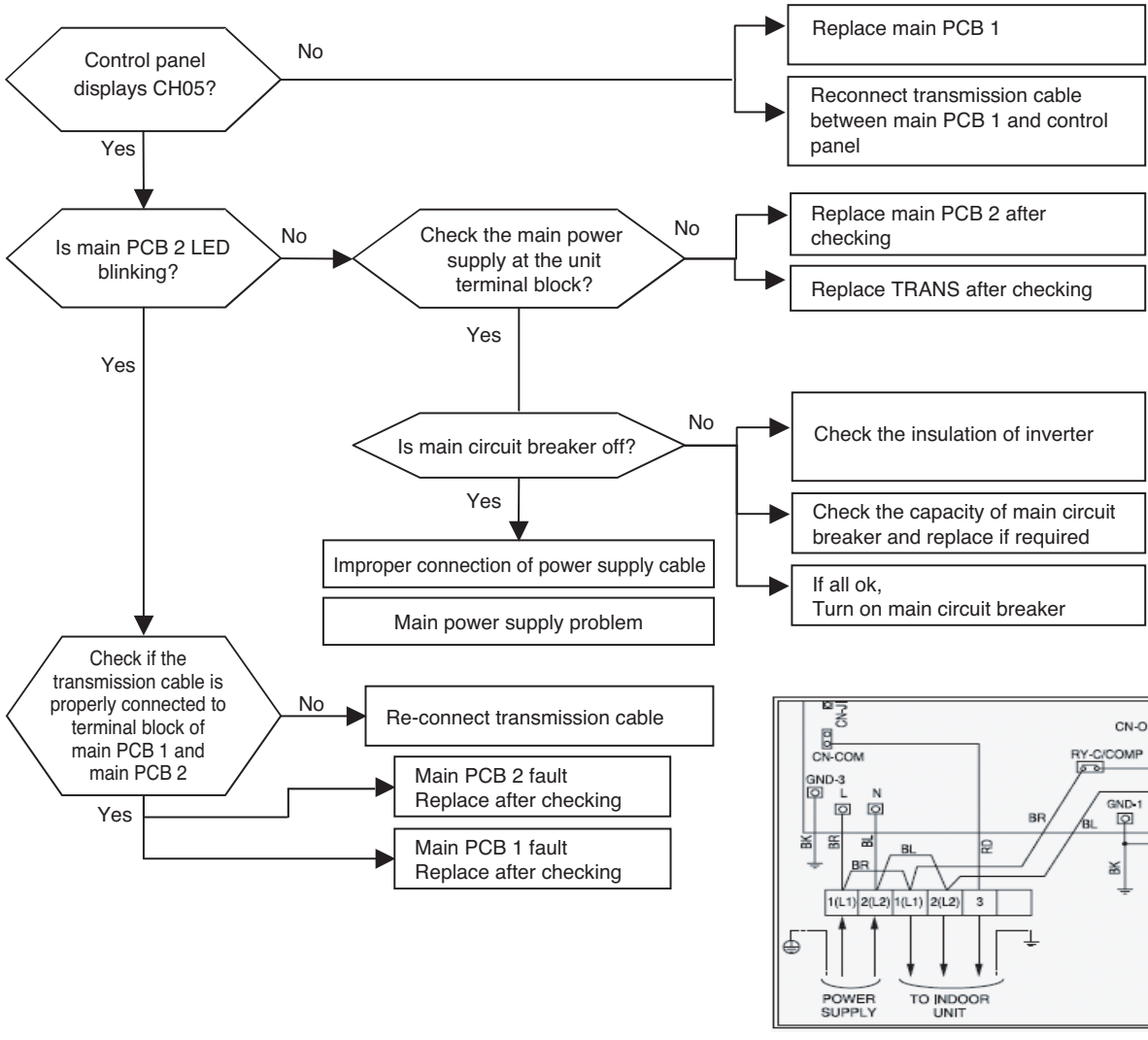
Code No.	Description	Cause	Normal Condition
05 53	Bad communication between main PCB 1 and main PCB 2.	• The connector for transmission is disconnected • The connecting wires are misconnected • The communication line is broken • Outdoor PCB is abnormal • Indoor PCB is abnormal	• Wire connection between control panel and main PCB 1 should be tight

■ Error diagnosis and countermeasure flow chart



※ CH05 is displayed at unit,
CH53 is displayed at outdoor unit.

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Code No.	Description	Cause	Normal Condition
09	PCB Program (EEPROM) Fault	• Electrical or mechanical damage a the EEPROM	• This error can not be permitted

■ Error diagnosis and countermeasure flow chart

- Replace the main PCB 1

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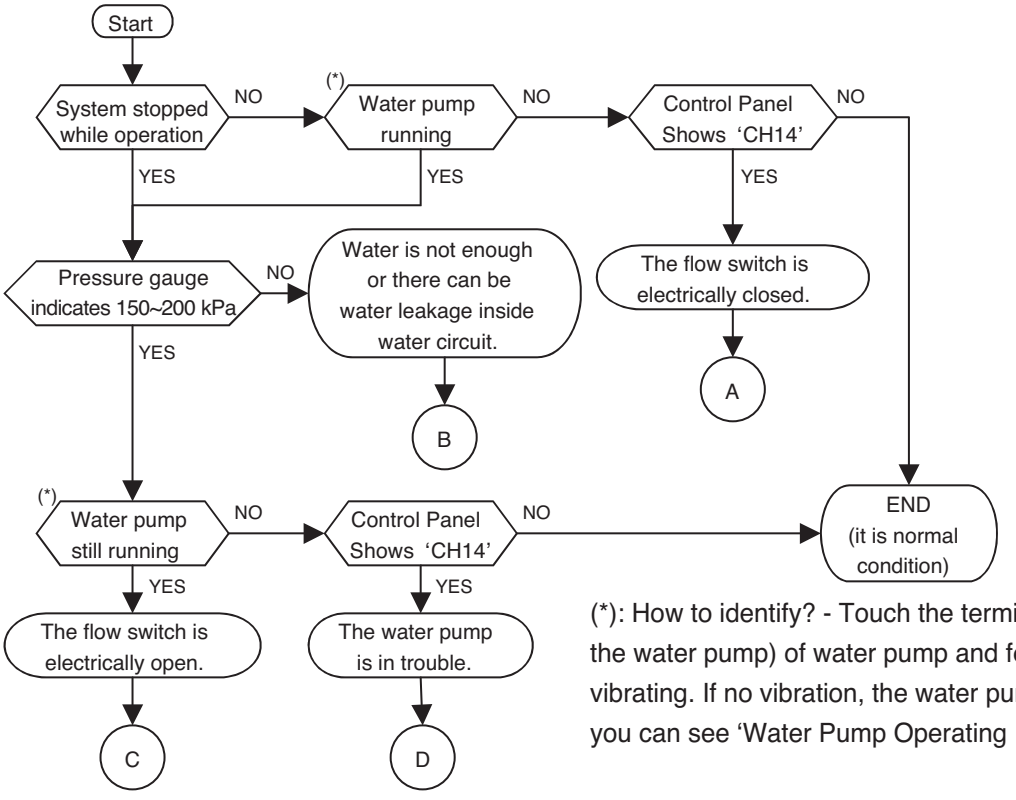
Code No.	Description	Cause	Normal Condition
14	Problem in Flow Switch	• Flow switch is open while internal water pump is working • Flow switch is closed while internal water pump is not working • Flow switch is open while DIP switch No. 5 of main PCB 1 is set as ON	• Flow switch should be closed while internal water pump is working or DIP switch No. 5 of main PCB 1 is set as ON • Flow switch should be open while internal water pump is not working

■ Error diagnosis and countermeasure flow chart



(*): How to identify? - Touch the terminal box (black plastic box at the water pump) of water pump and feel if the water pump is vibrating. If no vibration, the water pump is not operating. Also, you can see 'Water Pump Operating Icon ( )' at control panel.

A
- Although there is not water flow inside water circuit, the flow switch detects as if water is flowing. It is due to electrically closed (or short) of flow switch or the contact of flow switch is mechanically stuck.
- Contact official After Service Center and replace the flow switch.
- Check the air vent. If there is air in the unit, it can display "CH14". Please remove the air by using the air vent.

B
- Check if water inside water circuit is fully charged. Pressure gauge at the unit should indicate 150~200 kPa.
- Also, as the hand of the pressure gauge is not react so fast according to water charging, check the pressure gauge again.
- Otherwise, there can be water leakage inside water circuit. Examine if water circuit is completely sealed.

C
- Although water is well flowing, the flow switch can not detect water flow. It is due to electrically open of flow switch or the contact of flow switch is mechanically broken.
- Contact official After Service Center and replace the flow switch.

D
- Read 'Checking Key Components of unit – Water Pump' carefully to get more detail information.
- Contact official After Service Center and replace the water pump.
- Also, check the water quality if there are particles that can yield locking at the shaft of the water pump.
- Check the air vent. If there is air in the unit, it can display "CH14". Please remove the air by using the air vent.

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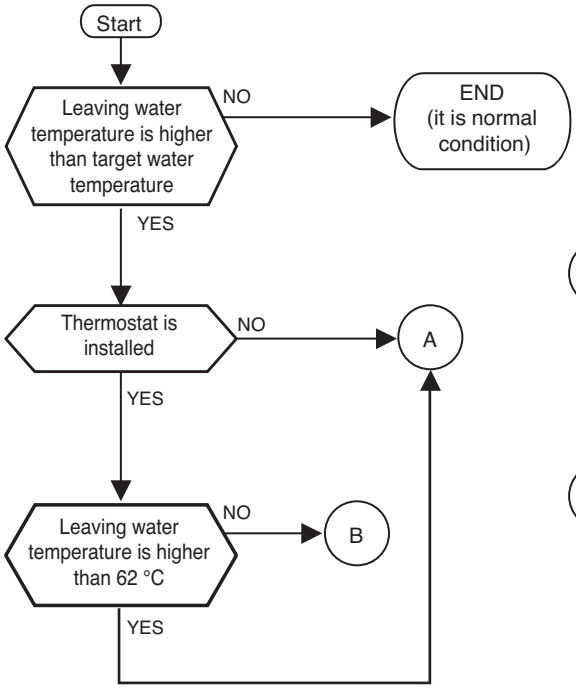
Code No.	Description	Cause	Normal Condition
15	Water pipe overheated	• Abnormal operation of electric heater • Leaving water temperature is above 67 °C	• If there is no problem in electric heater control, possible maximum leaving water temperature is 62 °C.



A
- This is unexpected case.
- Turn off the system and call service center.
- If the system is not turned off before it yields error code (CH15), very hot leaving water will be generated and it is harmful to human.

B
- Room air is not fully heated by under floor heating.
- Wait while room air is heated by target temperature of thermostat.

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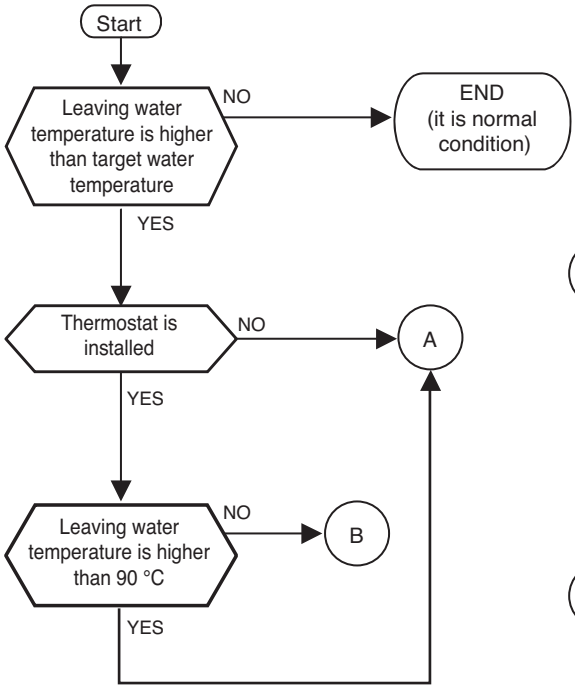
Code No.	Description	Cause	Normal Condition
20	Electric Heater Overheated	• Abnormal operation of electric heater • Leaving water temperature is above 90 °C	• If there is no problem in electric heater control, possible maximum leaving water temperature is 62 °C.



A
- This is unexpected case.
- Turn off the system and call service center.
- If the system is not turned off before it yields error code (CH20), very hot leaving water will be generated and it is harmful to human.
- If Error Code (CH20) is occurred, please check thermostat, electric heater, power supply and others. Also, it is recommended to check air vent which is located on the top of the electric heater tank.

B
- Room air is not fully heated by under floor heating.
- Wait while room air is heated by target temperature of thermostat.

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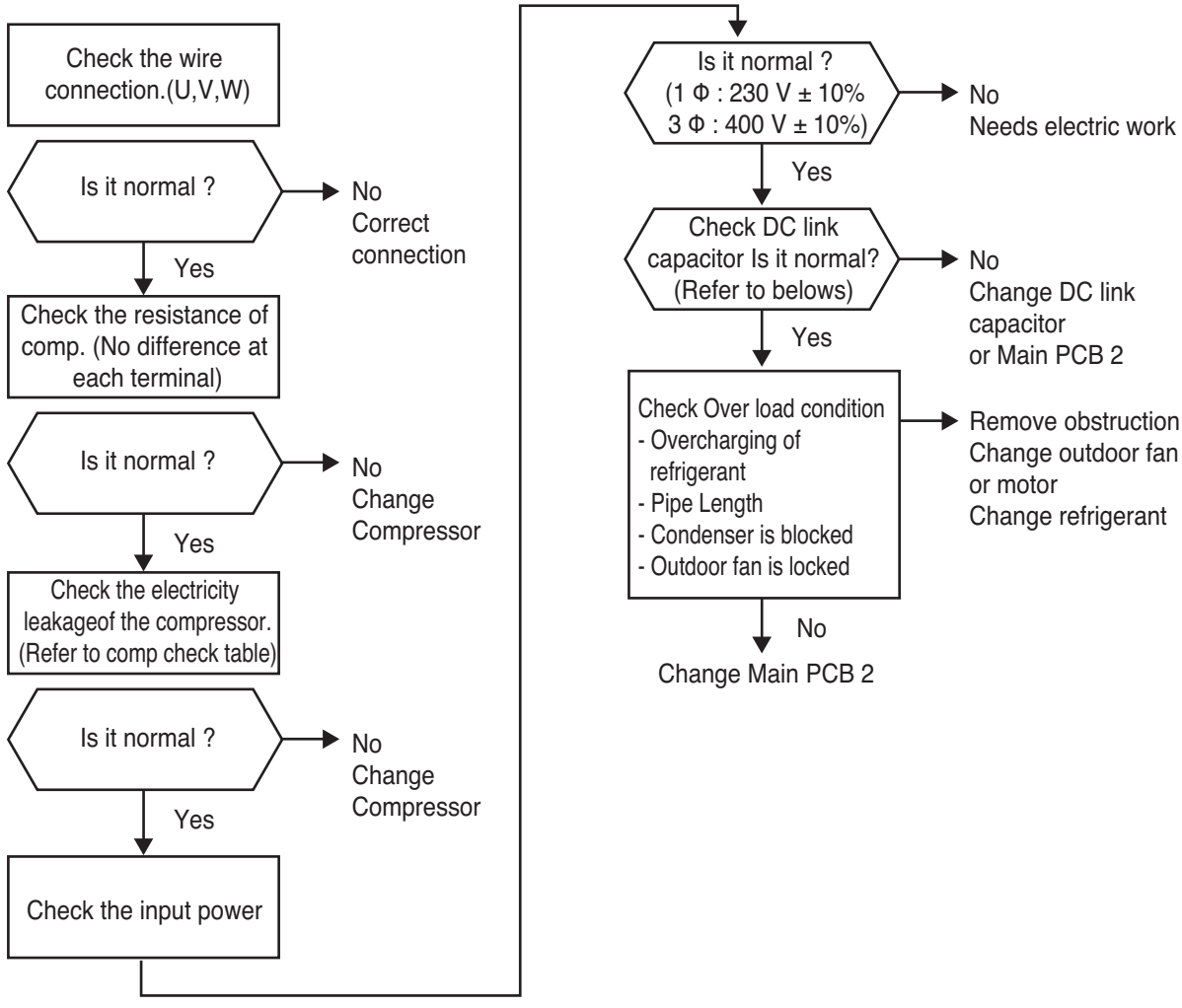
Display code	Title	Cause of error	Check point & Normal condition
21	DC Peak	• Instant over current • Over Rated current • Poor insulation of IPM	• An instant over current in the U,V,W phase - Comp lock - The abnormal connection of U,V,W • Over load condition - Overcharging of refrigerant - Pipe length. • Poor insulation of compressor

Check Flow Chart



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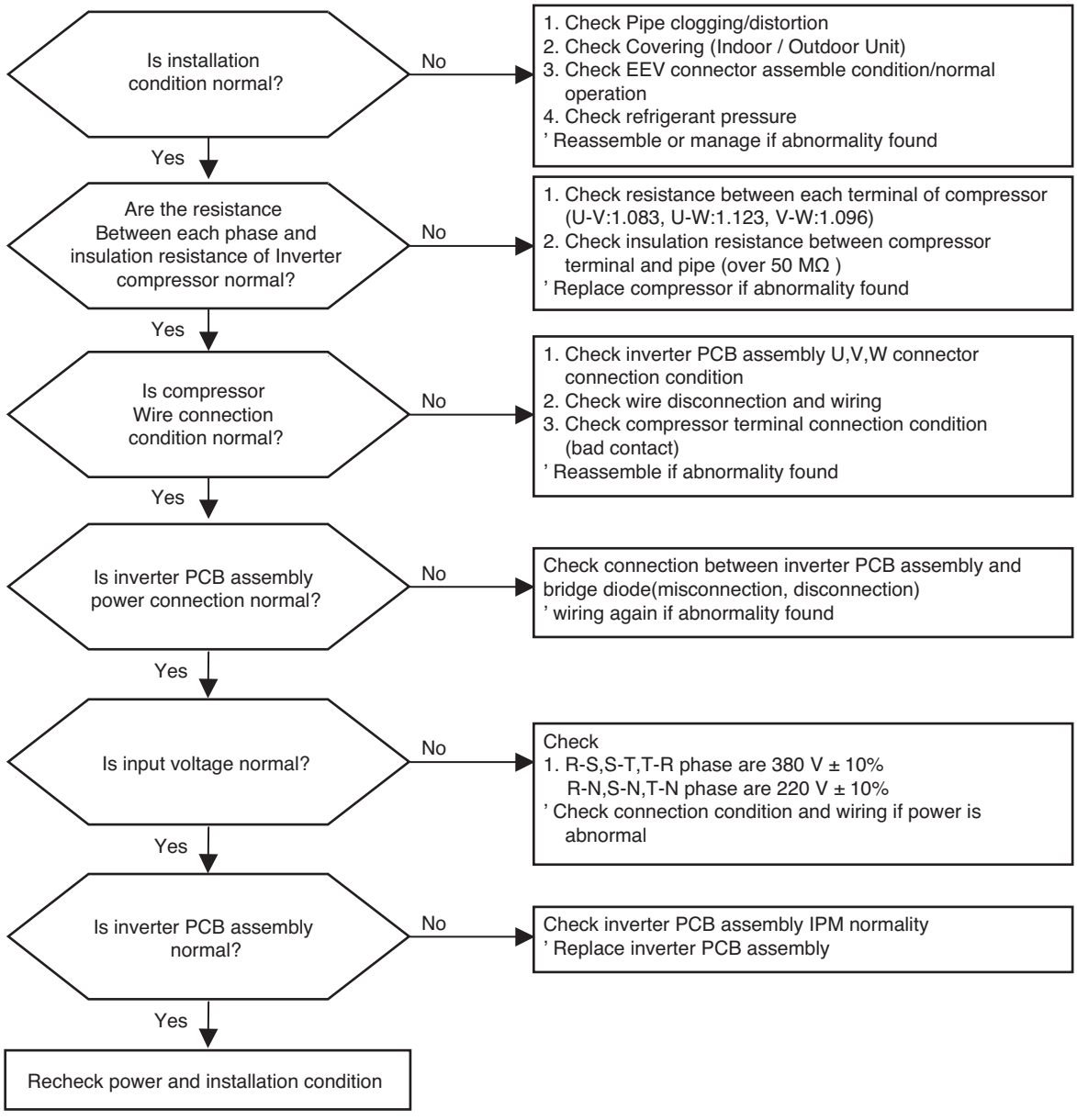
Display code	Title	Cause of error	Check point & Normal condition
22	Max. C/T	• Over current	• Malfunction of compressor • Blocking of pipe • Low voltage input • Refrigerant, pipe length, blocked, …


Is installation condition normal?
No
1. Check Pipe clogging/distortion
2. Check Covering (Indoor / Outdoor Unit)
3. Check EEV connector assemble condition/normal operation
4. Check refrigerant pressure
' Reassemble or manage if abnormality found
Yes
Are the resistance Between each phase and insulation resistance of Inverter compressor normal?
No
1. Check resistance between each terminal of compressor (U-V:1.083, U-W:1.123, V-W:1.096)
2. Check insulation resistance between compressor terminal and pipe (over 50 MΩ)
' Replace compressor if abnormality found
Yes
Is compressor Wire connection condition normal?
No
1. Check inverter PCB assembly U,V,W connector connection condition
2. Check wire disconnection and wiring
3. Check compressor terminal connection condition (bad contact)
' Reassemble if abnormality found
Yes
Is inverter PCB assembly power connection normal?
No
Check connection between inverter PCB assembly and bridge diode(misconnection, disconnection)
' wiring again if abnormality found
Yes
Is input voltage normal?
No
Check
1. R-S,S-T,T-R phase are 380 V ± 10%
R-N,S-N,T-N phase are 220 V ± 10%
' Check connection condition and wiring if power is abnormal
Yes
Is inverter PCB assembly normal?
No
Check inverter PCB assembly IPM normality
' Replace inverter PCB assembly
Yes
Recheck power and installation condition

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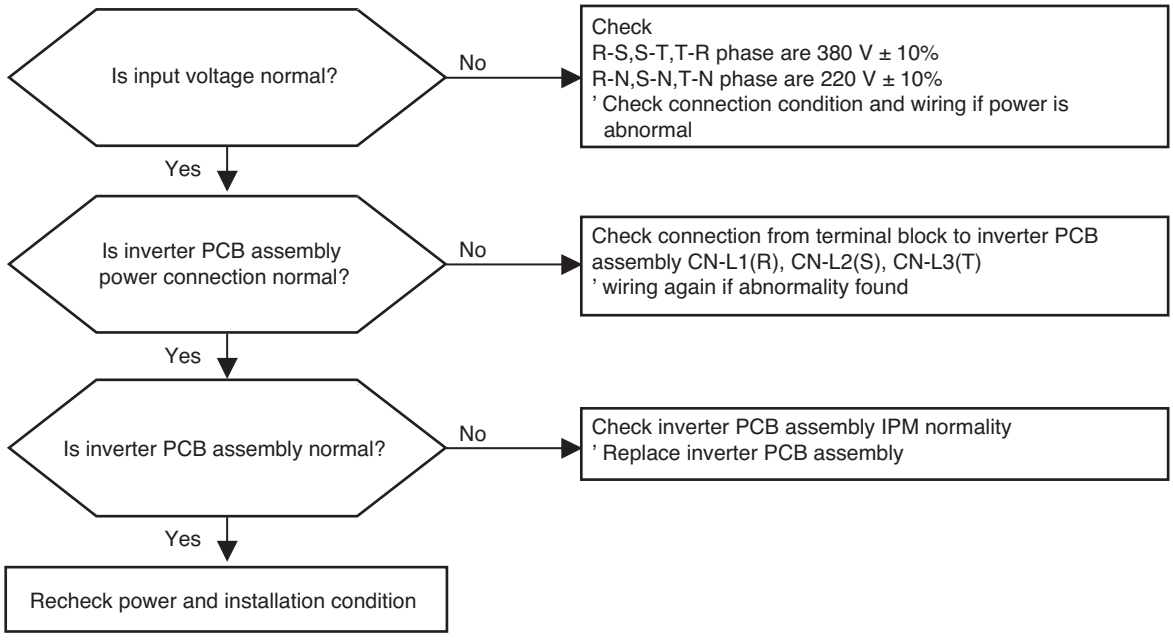
Display code	Title	Cause of error	Check point & Normal condition
23	DC Link Low voltage.	• 1ph : DC link volt. is 140 V DC ↓ • 3ph : DC link volt. is 250 V DC ↓	• Check the power source. • Check the components.
28	DC Link High voltage	• 1ph : DC link volt. is 140 V DC ↑ • 3ph : DC link volt. is 250 V DC ↑	• Check the power source. • Check the component. ※ It is related to “AHBW**8A0” model .


Is input voltage normal?
No
Check
R-S,S-T,T-R phase are 380 V ± 10%
R-N,S-N,T-N phase are 220 V ± 10%
’ Check connection condition and wiring if power is abnormal
Yes
Is inverter PCB assembly power connection normal?
No
Check connection from terminal block to inverter PCB assembly CN-L1(R), CN-L2(S), CN-L3(T)
’ wiring again if abnormality found
Yes
Is inverter PCB assembly normal?
No
Check inverter PCB assembly IPM normality
’ Replace inverter PCB assembly
Yes
Recheck power and installation condition

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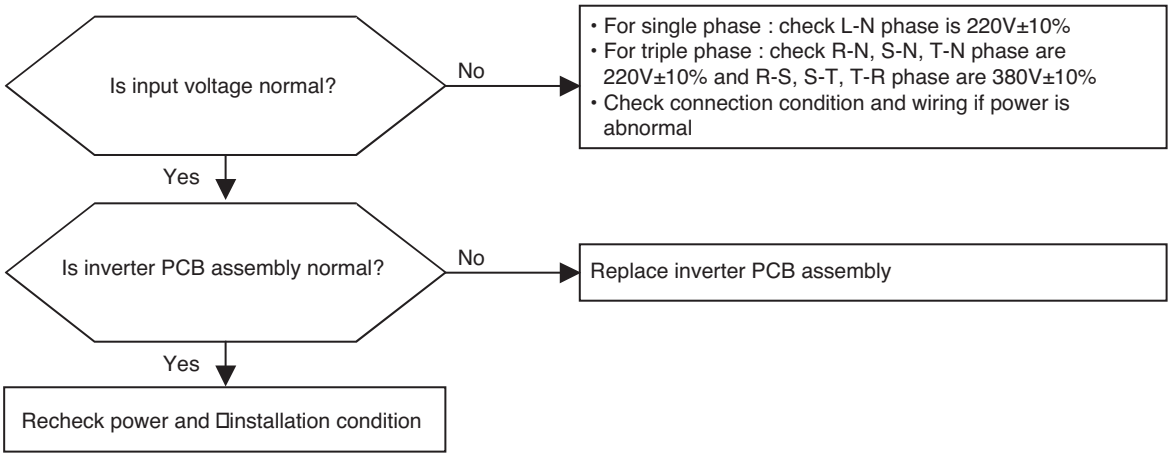
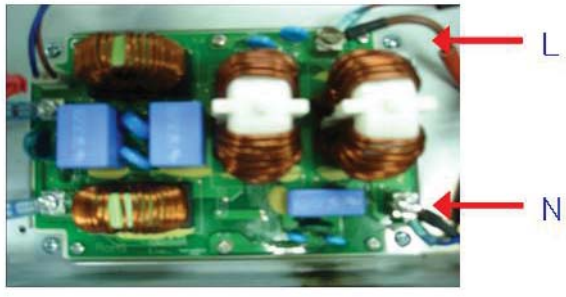
Display code	Title	Cause of error	Check point & Normal condition
28	Inverter DC link high voltage error	Inv PCB DC link voltage supplied over 780V	1. Input voltage abnormal (L~N) 2. ODU inverter PCB damage (DC Link voltage sensing part) ※ It is related to “AHBW**6*0” model.

■ Error Diagnosis and Countermeasure Flow Chart


Is input voltage normal?
No
• For single phase : check L-N phase is 220V±10%
• For triple phase : check R-N, S-N, T-N phase are 220V±10% and R-S, S-T, T-R phase are 380V±10%
• Check connection condition and wiring if power is abnormal
Yes
Is inverter PCB assembly normal?
No
Replace inverter PCB assembly
Yes
Recheck power and installation condition

Measuring input voltage

Noise filter wiring



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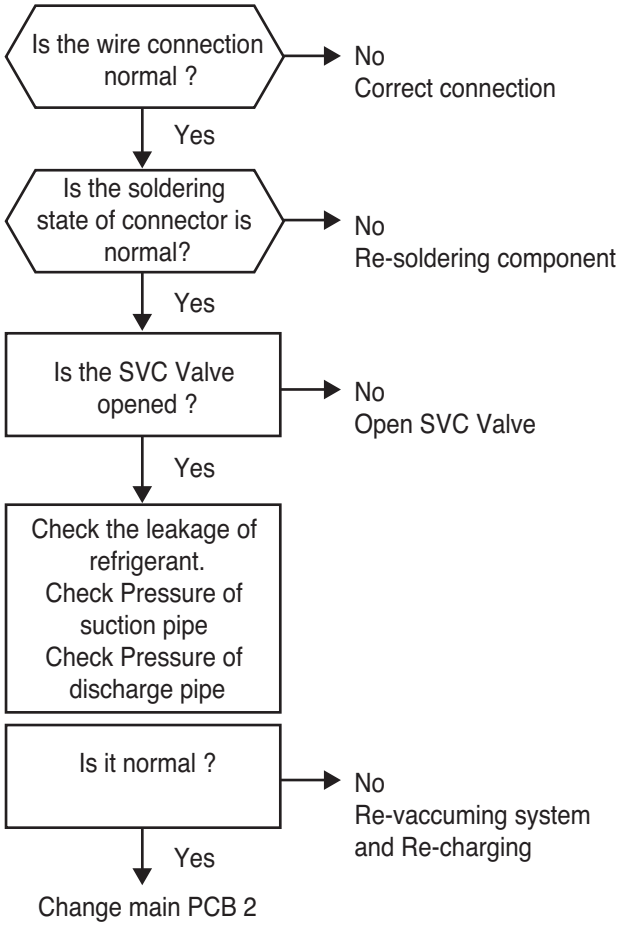
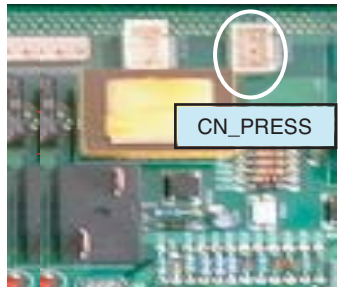
Display code	Title	Cause of error	Check point & Normal condition
24	Press S/W Open	• Low / High pressure S/W open.	• Check the connection of “CN_PRESS” • Check the SVC V/V open. • Check the leakage of refrigerant.

Check Flow Chart





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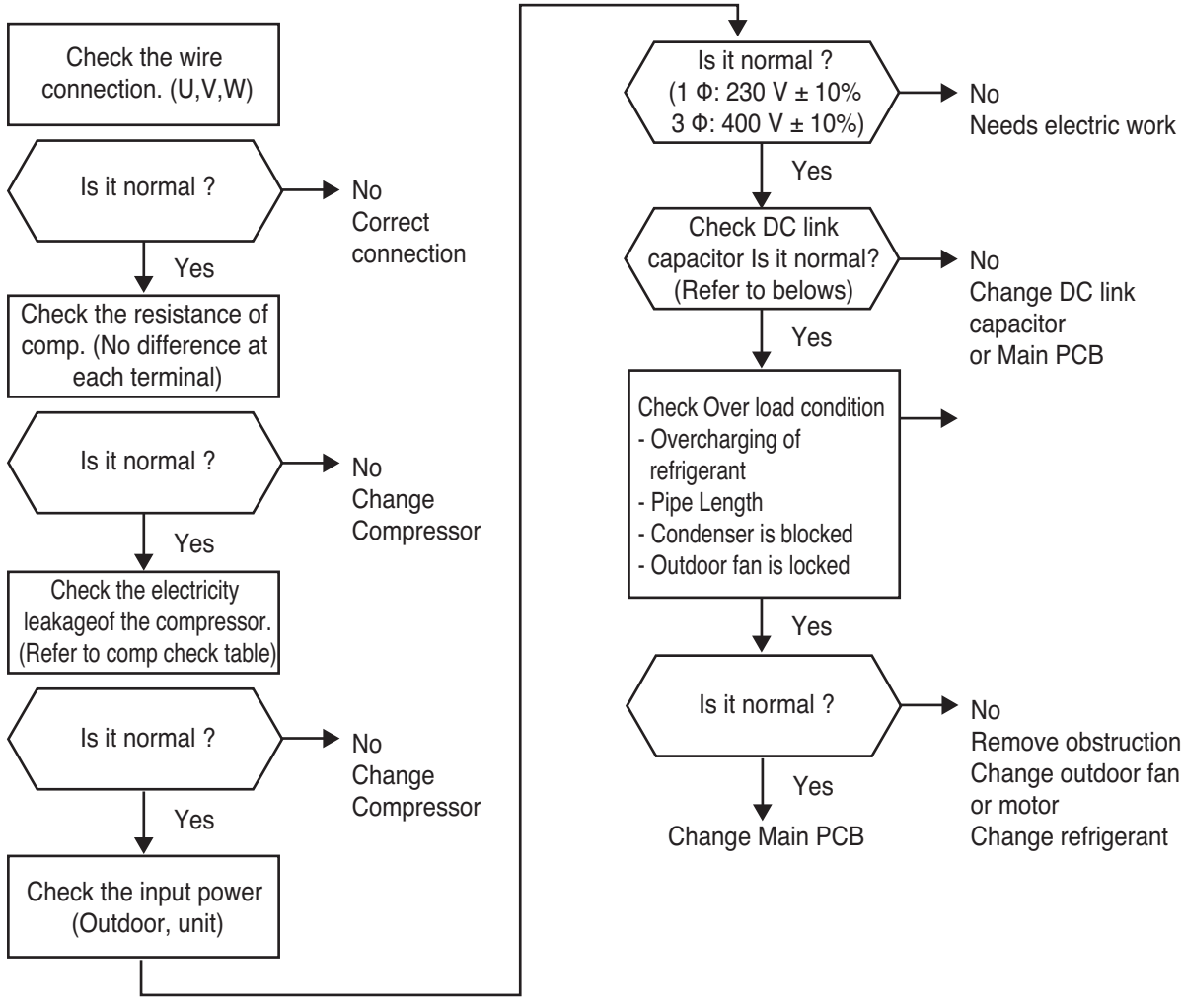
Display code	Title	Cause of error	Check point & Normal condition
26	DC Compressor Position	• Compressor position detect error	• Check the connection of comp wire “U,V,W” • Malfunction of compressor • Check the component of “IPM”, detection parts.
27	PSC Fault PFC Fault	• Over current at “IGBT”/PFC module	• Check the component of “IGBT” /PFC module. • Check the components.

Check Flow Chart



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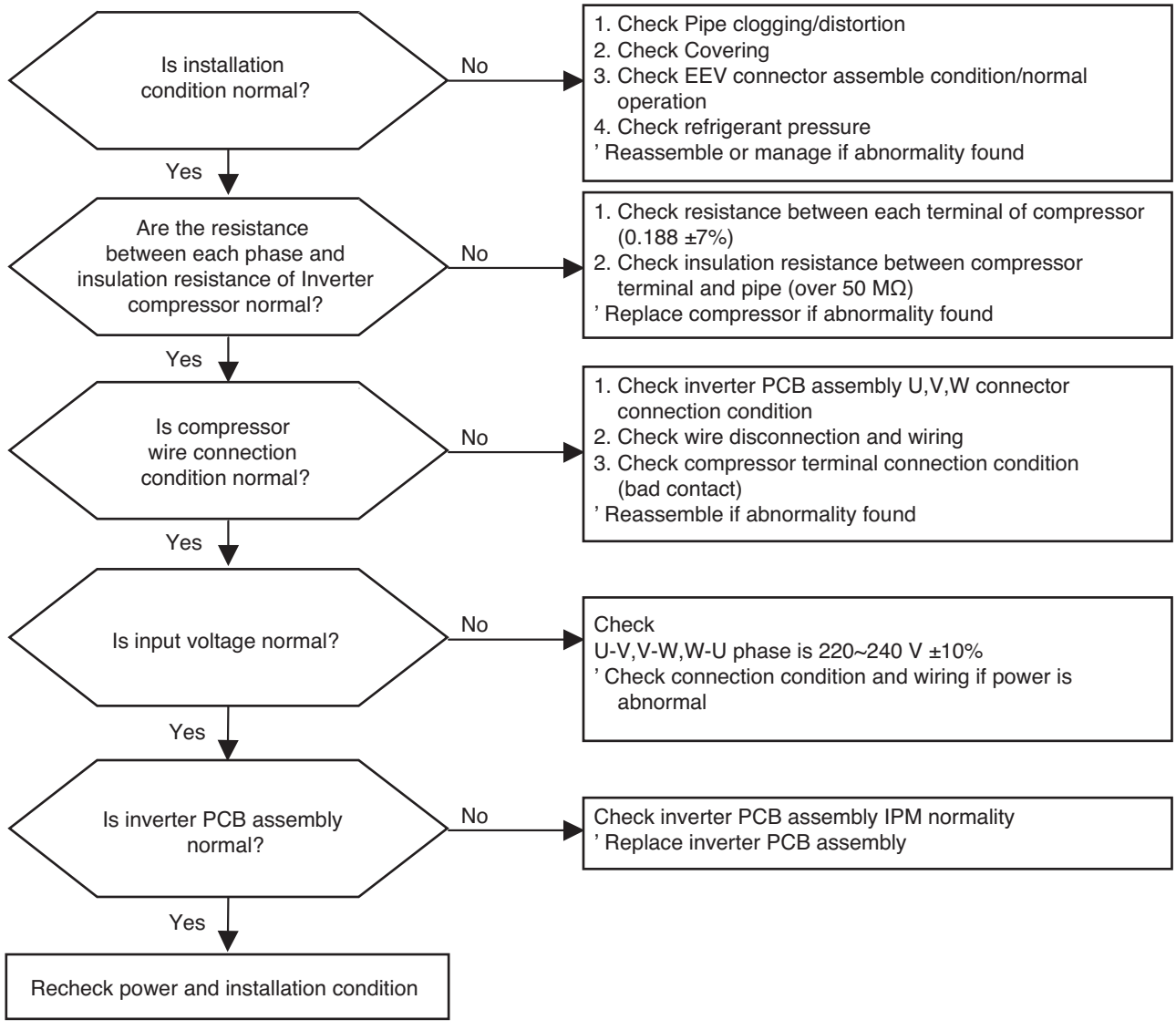
Display code	Title	Cause of error	Check point & Normal condition
29	Inverter compressor over current	Inverter compressor input current is over 24A	1. Overload operation (Pipe clogging / Covering / EEV defect / Ref. overcharge) 2. Compressor damage (Insulation damage/Motor damage) 3. Input voltage low 4. Inverter PCB assembly damage

Check Flow Chart


Is installation condition normal?
No
1. Check Pipe clogging/distortion
2. Check Covering
3. Check EEV connector assemble condition/normal operation
4. Check refrigerant pressure
' Reassemble or manage if abnormality found
Yes
Are the resistance between each phase and insulation resistance of Inverter compressor normal?
No
1. Check resistance between each terminal of compressor (0.188 ±7%)
2. Check insulation resistance between compressor terminal and pipe (over 50 MΩ)
' Replace compressor if abnormality found
Yes
Is compressor wire connection condition normal?
No
1. Check inverter PCB assembly U,V,W connector connection condition
2. Check wire disconnection and wiring
3. Check compressor terminal connection condition (bad contact)
' Reassemble if abnormality found
Yes
Is input voltage normal?
No
Check
U-V,V-W,W-U phase is 220~240 V ±10%
' Check connection condition and wiring if power is abnormal
Yes
Is inverter PCB assembly normal?
No
Check inverter PCB assembly IPM normality
' Replace inverter PCB assembly
Yes
Recheck power and installation condition

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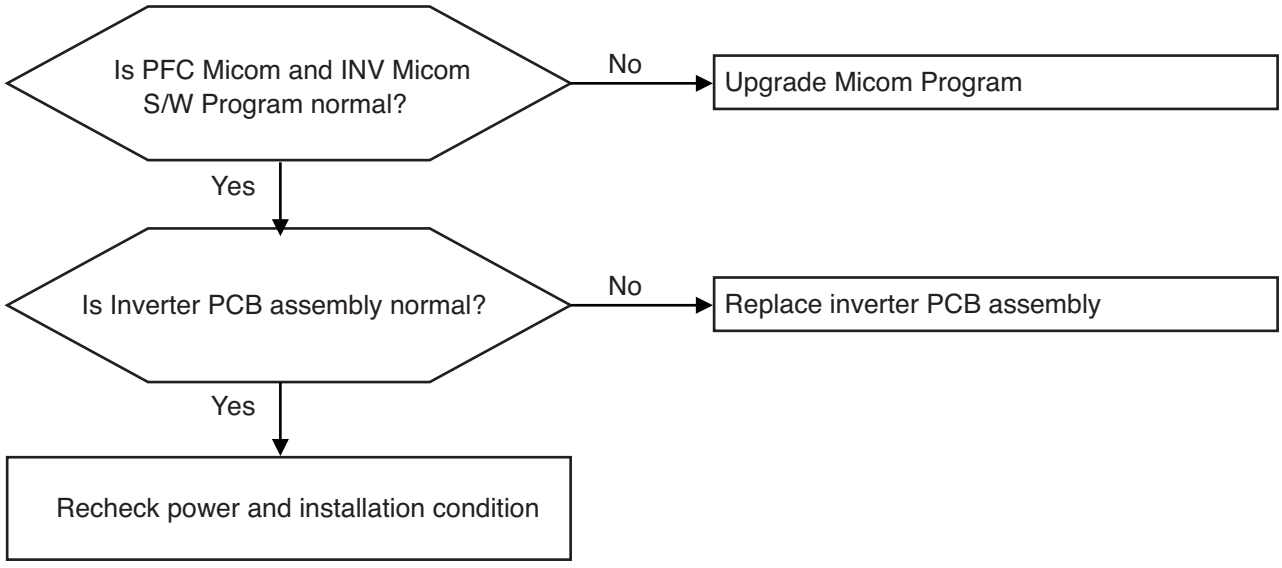
Display code	Title	Cause of error	Check point & Normal condition
39	Transmission Error Between (PFC Micom → INV Micom)	Communication Error Between PFC Micom and INV Micom.	1. Micom defect/Circuit defect 2. Different Micom S/W Version 3. Inverter PCB assembly damage

Check Flow Chart



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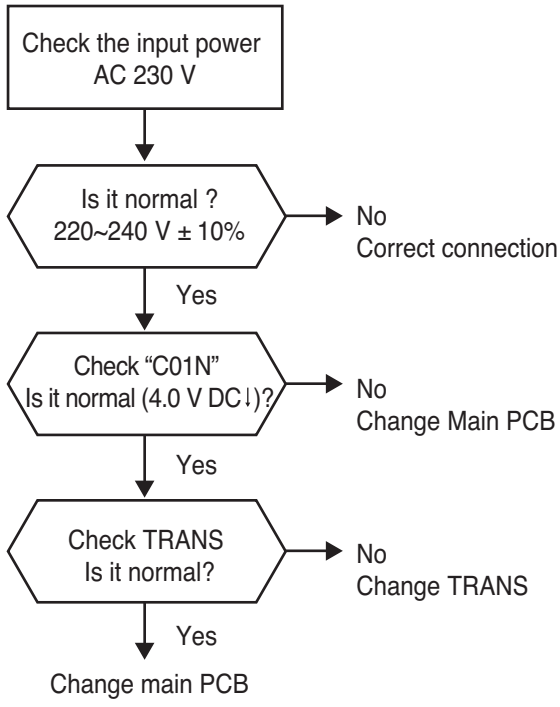
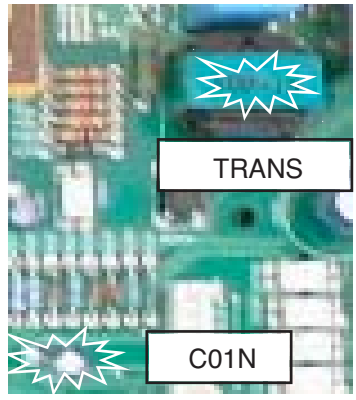
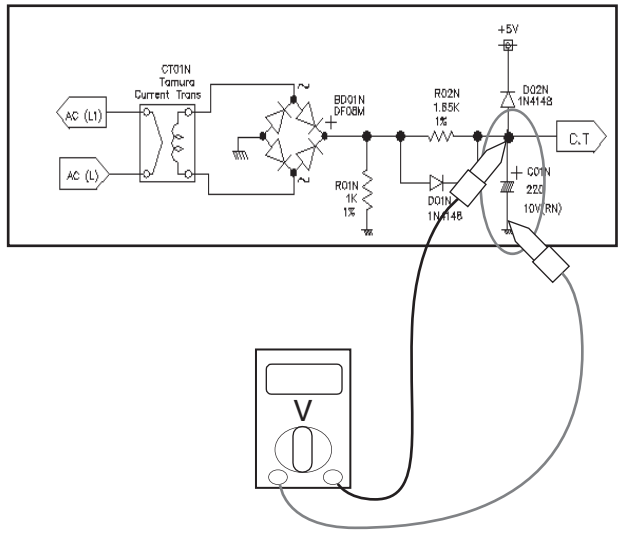
Display code	Title	Cause of error	Check point & Normal condition
40	C/T Internal circuit	• Initial current error	• Malfunction of current detection circuit. (Open / Short) • The voltage of “C01N” Is 4.0 V DC (25 A). ↑

Check Flow Chart







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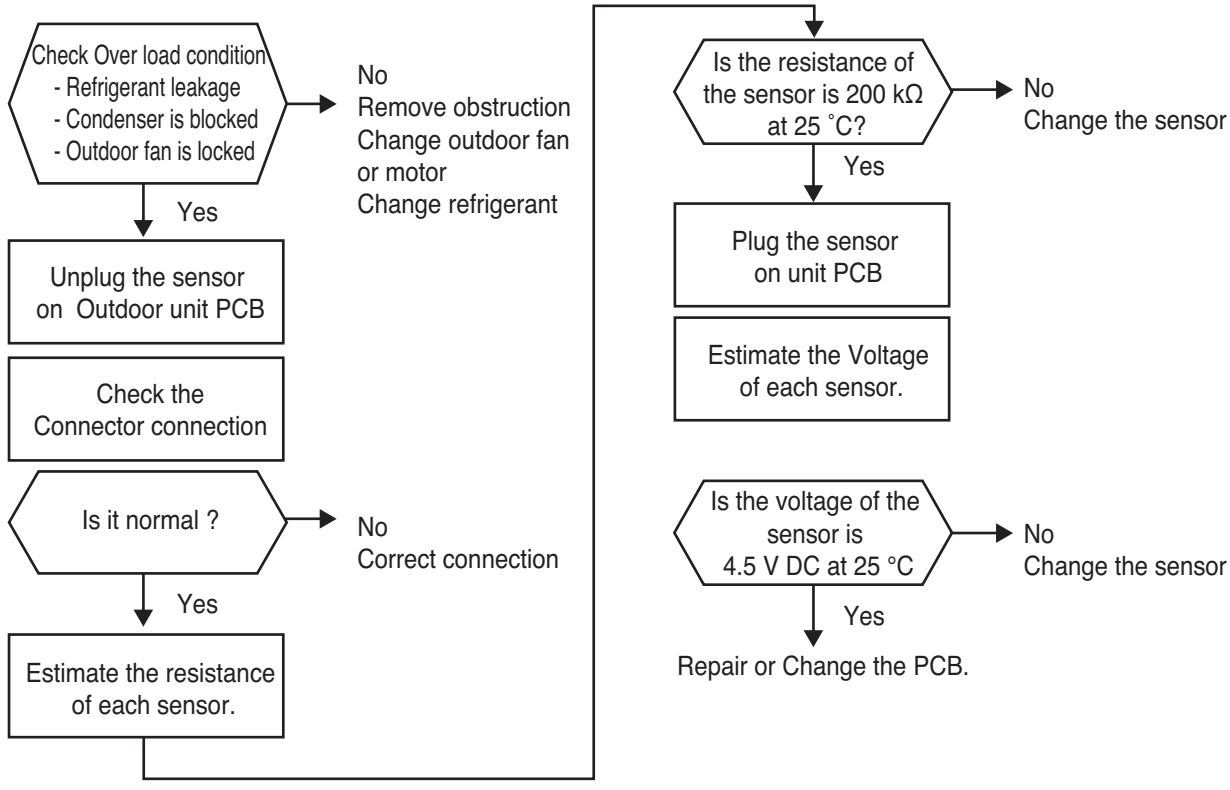
Display code	Title	Cause of error	Check point & Normal condition
32	D-pipe (Inverter) temp. high (105 ˚C↑)	• Discharge sensor (Inverter) temp. high	• Check the discharge pipe sensor for INV. • Check the install condition for over load. • Check the leakage of refrigerant. • Check the SVC V/V open. • Refer to sensor resistance table.
33	D-pipe (Constant) temp. high (105 ˚C↑)	• Discharge sensor (Cons.) temp. high	• Check the discharge pipe sensor for Cons. • Check the install condition for over load. • Check the leakage of refrigerant. • Check the SVC V/V open. • Refer to sensor resistance table.

Check Flow Chart



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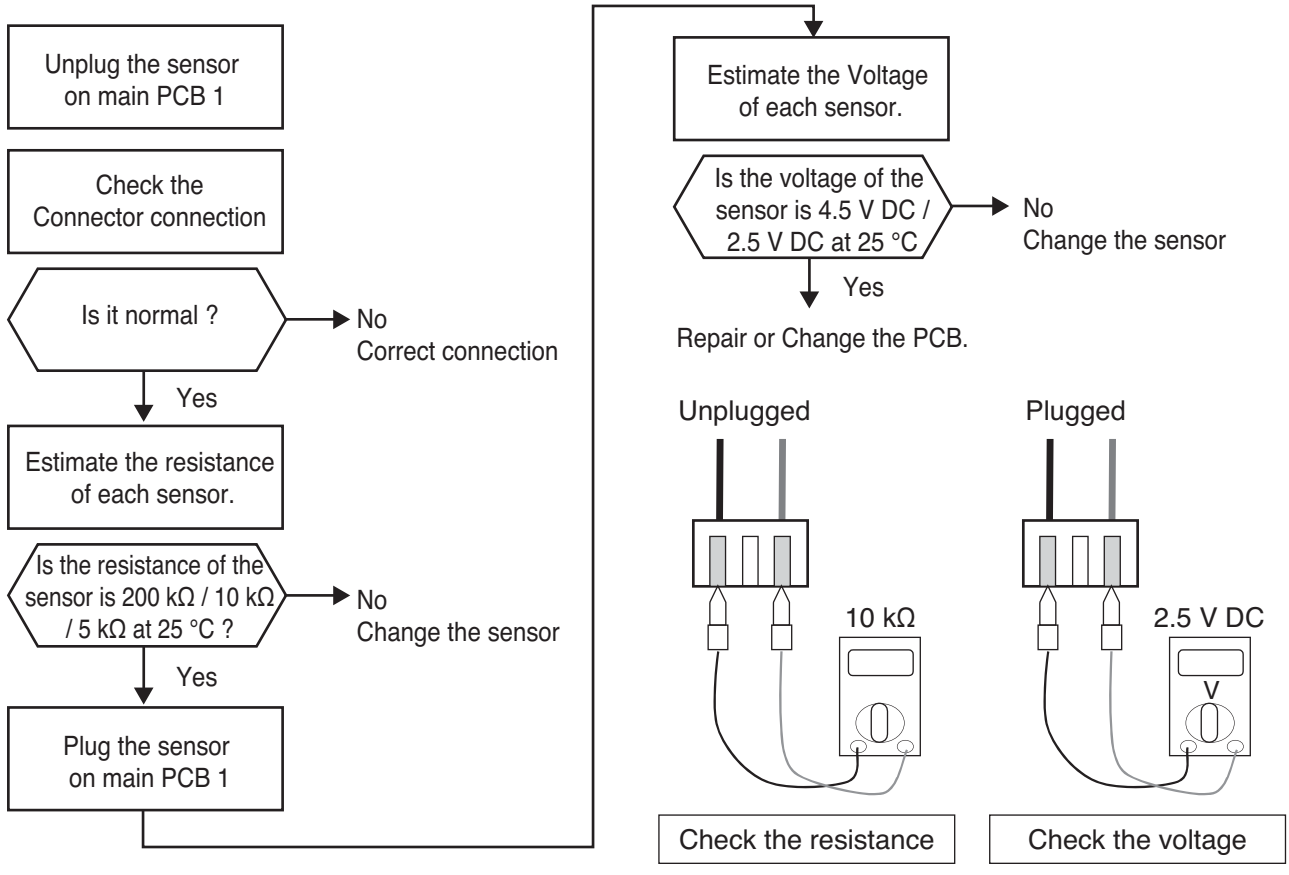
Display code	Title	Cause of error	Check point & Normal condition
41 **47**	D-pipe sensor (Inv) D-pipe sensor (Cons)	• Connector connection error • Faulty PCB • Faulty sensor (Open / Short)	• Normal resistor : 200 kΩ/ at 25 ˚C (Unplugged) • Normal voltage : 4.5 V DC / at 25 ˚C (plugged) • Refer to sensor resistance table.
44	Air sensor	• Connector connection error • Faulty PCB • Faulty sensor (Open / Short)	• Normal resistor : 10 kΩ/ at 25 ˚C (Unplugged) • Normal voltage : 2.5V DC / at 25 ˚C (plugged) • Refer to sensor resistance table.
45 **46**	Condenser Pipe sensor Suction Pipe sensor	• Connector connection error • Faulty PCB • Faulty sensor (Open / Short)	• Normal resistor : 5 kΩ/ at 25 ˚C (Unplugged) • Normal voltage : 2.5 V DC / at 25 ˚C (plugged) • Refer to sensor resistance table.
65	Heat sink sensor	• Connector connection error • Faulty PCB • Faulty sensor (Open / Short)	• Normal resistor : 5 kΩ/ at 25 ˚C (Unplugged) • Normal voltage : 2.5 V DC / at 25 ˚C (plugged) • Refer to sensor resistance table.

Check Flow Chart


Unplug the sensor on main PCB 1
Check the Connector connection
Is it normal ?
No
Correct connection
Yes
Estimate the resistance of each sensor.
Is the resistance of the sensor is 200 kΩ / 10 kΩ / 5 kΩ at 25 °C ?
No
Change the sensor
Yes
Plug the sensor on main PCB 1
Estimate the Voltage of each sensor.
Is the voltage of the sensor is 4.5 V DC / 2.5 V DC at 25 °C
No
Change the sensor
Yes
Repair or Change the PCB.
Unplugged
10 kΩ
Plugged
2.5 V DC
V
Check the resistance
Check the voltage

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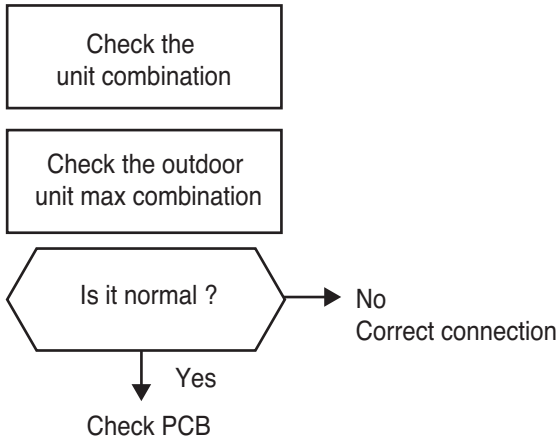
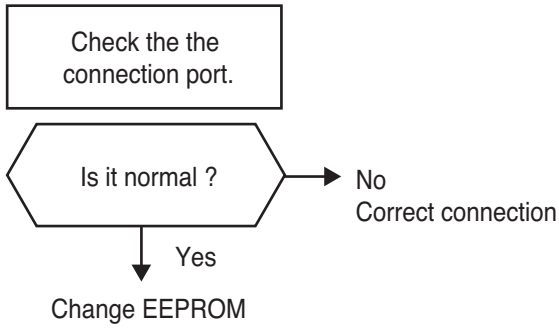
Display code	Title	Cause of error	Check point & Normal condition
51	Over capacity	• Over capacity Combination	• Check the unit capacity. • Check the combination table.
60	EEPROM Check sum	• Check sum error	• Check the connection port. • Check the poor soldering.

Check Flow Chart (CH51)



Check Flow Chart (CH60)



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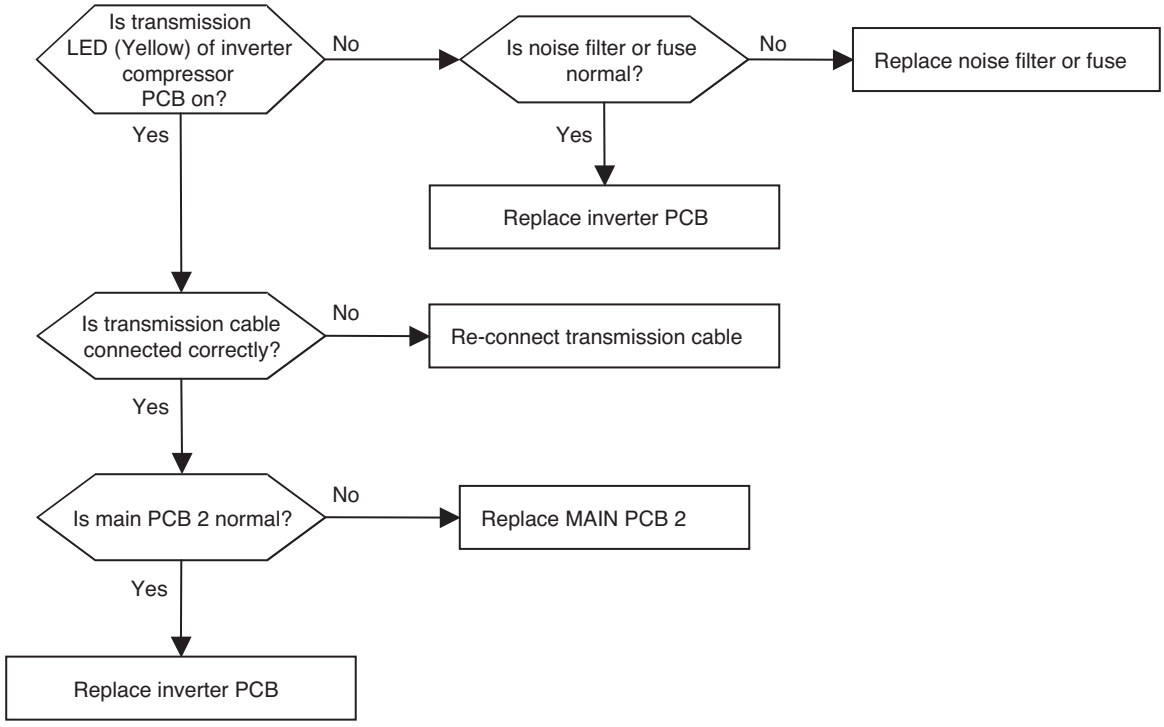
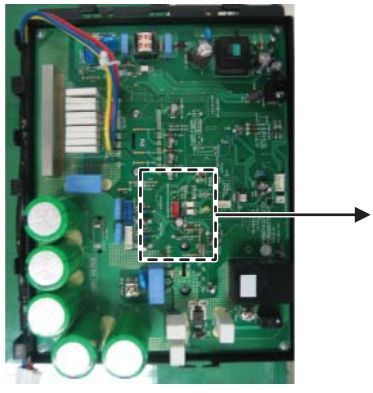
Display code	Title	Cause of error	Check point & Normal condition
52	Transmission error between (Inverter PCB ➔ Main PCB 2)	Main controller of Master unit of Master unit can't receive signal from inverter controller	1. Power cable or transmission cable is not connected 2. Defect of Main fuse/Noise Filter 3. Defect of Main / inverter PCB

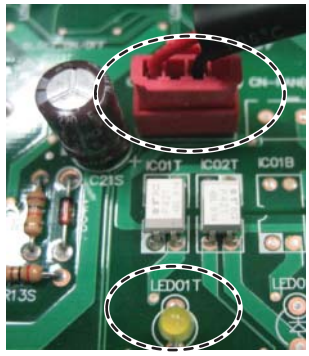
■ Error diagnosis and countermeasure flow chart



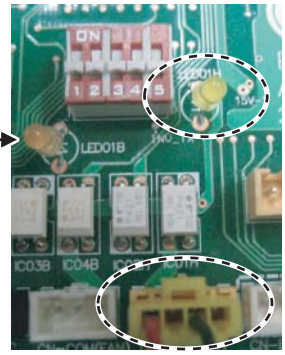
Check point

- Check the transmission connector and LED (Main & Inverter)





<Inverter PCB>



<MAIN PCB 2>

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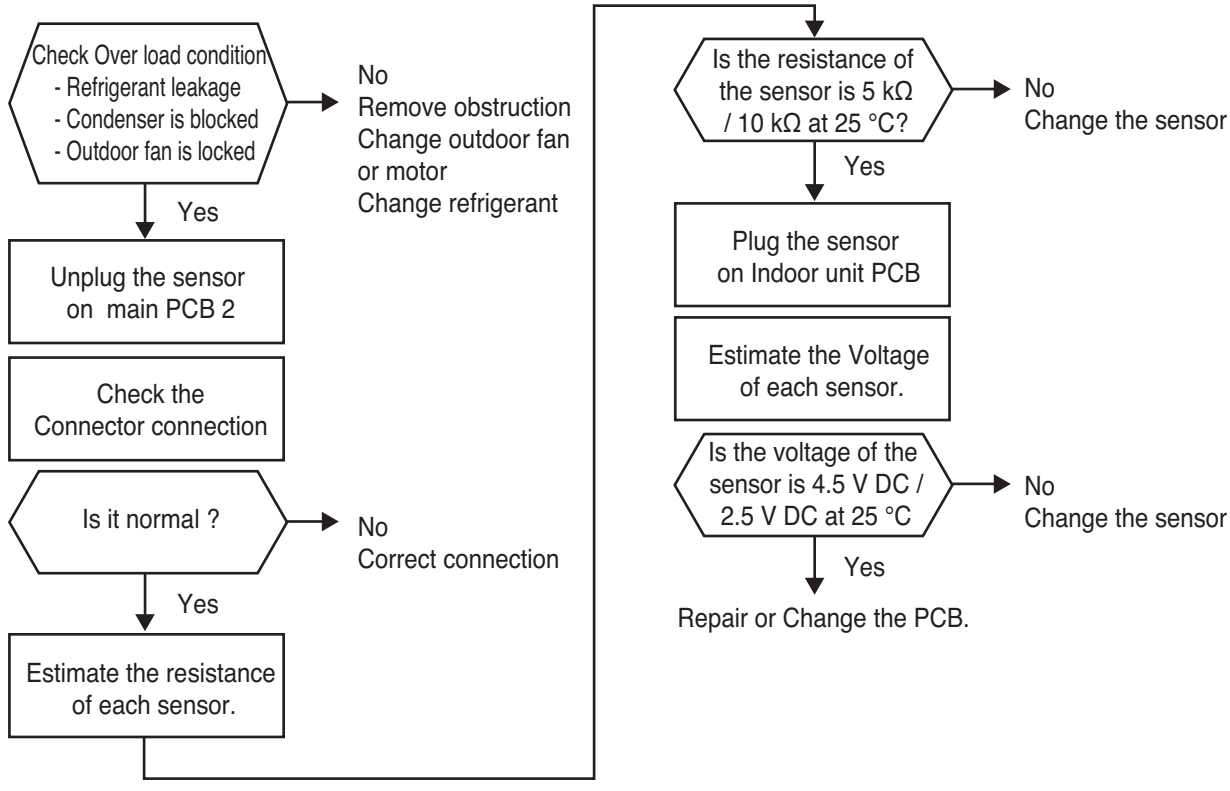
Display code	Title	Cause of error	Check point & Normal condition
61	Condenser pipe sensor temp. high	• condenser pipe sensor detected high temp. (65 ˚C)	• Check the load condition. • Check the sensor of Condenser pipe sensor. • Normal resistor : 5 kΩ at 25 °C (Unplugged) • Normal voltage : 2.5 V DC at 25 °C (Plugged)
62	Heat sink sensor temp. high	• heat sink sensor detected high temp. (85 ˚C)	• Check the load condition. • Check the sensor of heat sink. • Normal resistor : 10 kΩ at 25 °C (Unplugged) • Normal voltage : 2.5 V DC at 25 °C (Plugged)

Check Flow Chart


Check Over load condition
- Refrigerant leakage
- Condenser is blocked
- Outdoor fan is locked
No
Remove obstruction
Change outdoor fan or motor
Change refrigerant
Yes
Unplug the sensor on main PCB 2
Check the Connector connection
Is it normal ?
No
Correct connection
Yes
Estimate the resistance of each sensor.
Is the resistance of the sensor is 5 kΩ / 10 kΩ at 25 °C?
No
Change the sensor
Yes
Plug the sensor on Indoor unit PCB
Estimate the Voltage of each sensor.
Is the voltage of the sensor is 4.5 V DC / 2.5 V DC at 25 °C
No
Change the sensor
Yes
Repair or Change the PCB.

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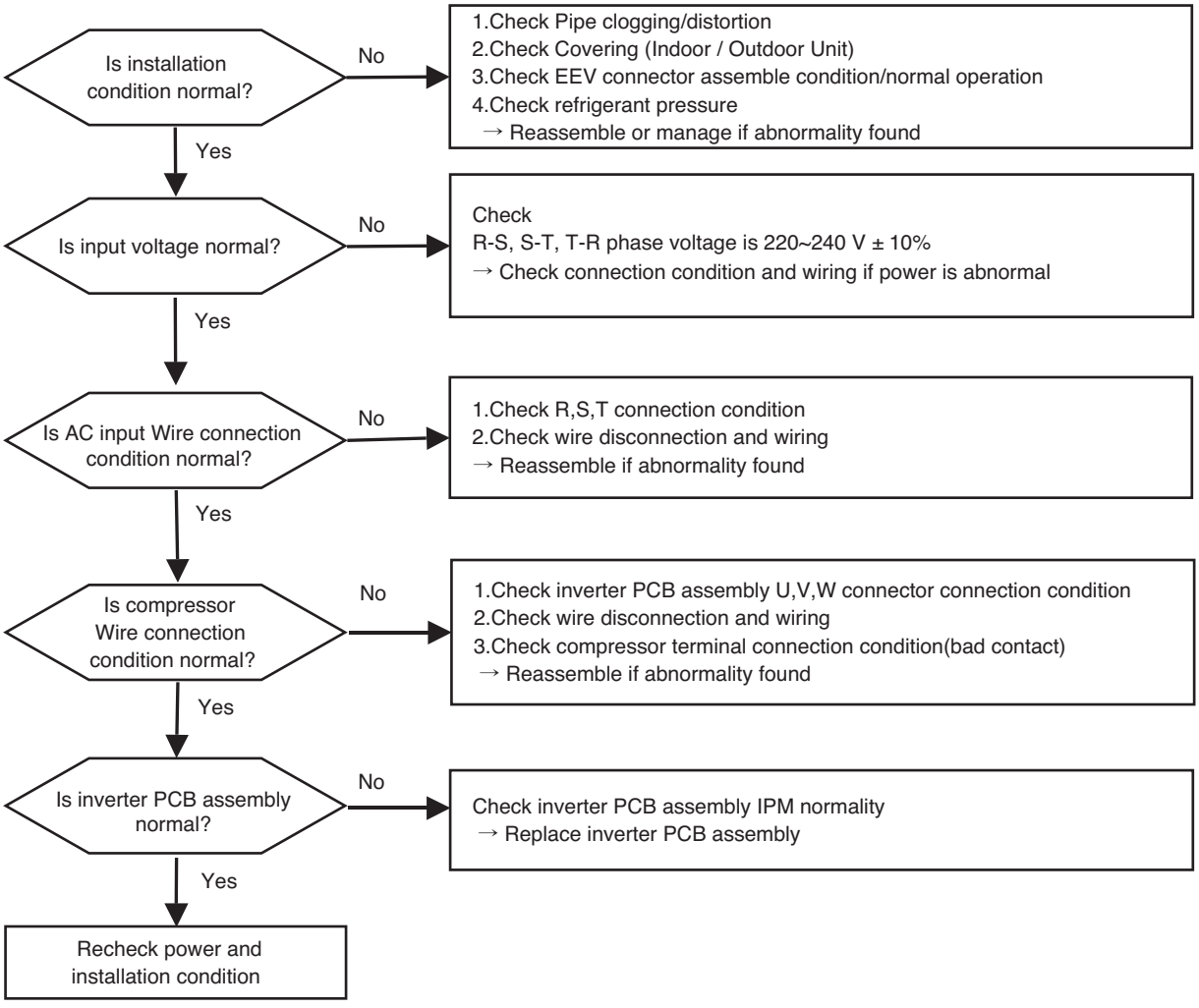
Display code	Title	Cause of error	Check point & Normal condition
73	AC input instant over current error (Matter of software)	Inverter PCB input power current is over 24 A (peak) for 2ms	1. Overload operation (Pipe clogging/Covering/EEV defect/Ref.overcharge) 2. Compressor damage (Insulation damage/Motor damage) 3. Input voltage abnormal (L, N) 4. Power line assemble condition abnormal 5. Inverter PCB assembly damage (input current sensing part)

Check Flow Chart


Is installation condition normal?
No
1.Check Pipe clogging/distortion
2.Check Covering (Indoor / Outdoor Unit)
3.Check EEV connector assemble condition/normal operation
4.Check refrigerant pressure
→ Reassemble or manage if abnormality found
Yes
Is input voltage normal?
No
Check
R-S, S-T, T-R phase voltage is 220~240 V ± 10%
→ Check connection condition and wiring if power is abnormal
Yes
Is AC input Wire connection condition normal?
No
1.Check R,S,T connection condition
2.Check wire disconnection and wiring
→ Reassemble if abnormality found
Yes
Is compressor Wire connection condition normal?
No
1.Check inverter PCB assembly U,V,W connector connection condition
2.Check wire disconnection and wiring
3.Check compressor terminal connection condition(bad contact)
→ Reassemble if abnormality found
Yes
Is inverter PCB assembly normal?
No
Check inverter PCB assembly IPM normality
→ Replace inverter PCB assembly
Yes
Recheck power and installation condition

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Sensor resistance table

Pipe Temp

B Constant	3977	
Std Temp	25	
Resistance	5	
Temp	Resistance	Volt
-30	102.17	4.714
-25	73.49	4.611
-20	53.55	4.481
-15	39.5	4.322
-10	29.48	4.131
-5	22.24	3.91
0	16.95	3.661
5	13.05	3.389
10	10.14	3.102
15	7.94	2.808
20	6.28	2.515
25	5	2.232
30	4.01	1.965
35	3.24	1.717
40	2.64	1.493
45	2.16	1.293
50	1.78	1.116
55	1.48	0.962
60	1.23	0.828
65	1.03	0.714
70	0.87	0.615
75	0.74	0.531
80	0.63	0.459
85	0.54	0.397
90	0.46	0.345
95	0.4	0.3
100	0.34	0.262

Air Temp

B Constant	3977	
Std Temp	25	
Resistance	10	
Temp	Resistance	Volt
-30	204.35	4.72
-25	146.97	4.62
-20	107.09	4.492
-15	79	4.336
-10	58.95	4.149
-5	44.47	3.931
0	33.9	3.685
5	26.09	3.416
10	20.27	3.131
15	15.89	2.838
20	12.55	2.546
25	10	2.262
30	8.03	1.994
35	6.49	1.745
40	5.28	1.519
45	4.32	1.316
50	3.56	1.137
55	2.95	0.981
60	2.46	0.846
65	2.06	0.729
70	1.74	0.628
75	1.47	0.542
80	1.25	0.469
85	1.07	0.406
90	0.92	0.353
95	0.79	0.307
100	0.68	0.268

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Heatsink Temp

B Constant	3970	
Std Temp	25	
Resistance	10	
Temp	Resistance	Volt
-30	102.17	4.71
-25	73.49	4.61
-20	53.55	4.48
-15	39.5	4.32
-10	29.48	4.13
-5	22.24	3.91
0	16.95	3.66
5	26.05	4.73
10	20.25	4.66
15	15.87	4.57
20	12.55	4.47
25	10	4.35
30	8.03	4.21
35	6.49	4.06
40	5.28	3.89
45	4.33	3.71
50	3.57	3.52
55	2.96	3.32
60	2.47	3.11
65	2.07	2.9
70	1.74	2.69
75	1.48	2.48
80	1.26	2.28
85	1.07	2.09
90	0.92	1.9
95	0.8	1.73
100	0.69	1.57

D-Pipe Temp

B Constant	3500	
Std Temp	25	
Resistance	200	
Temp	Resistance	Volt
-30	2845.99	4.969
0	585.66	4.851
5	465.17	4.814
10	372.49	4.77
15	300.58	4.717
20	244.33	4.657
25	200	4.587
30	164.79	4.508
35	136.64	4.418
40	113.98	4.318
45	95.62	4.208
50	80.65	4.088
55	68.38	3.958
60	58.27	3.82
65	49.88	3.674
70	42.9	3.522
75	37.05	3.365
80	32.14	3.205
85	27.99	3.043
90	24.46	2.88
95	21.46	2.719
100	18.89	2.561
110	14.79	2.255
120	11.72	1.972
130	9.4	1.716
140	7.62	1.487
150	6.24	1.287

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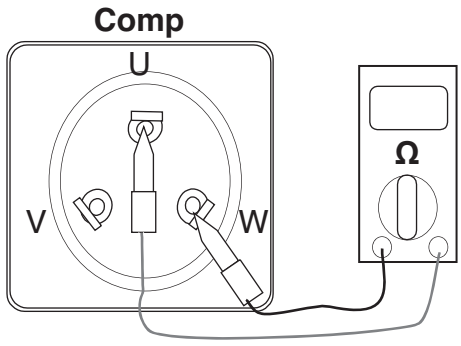
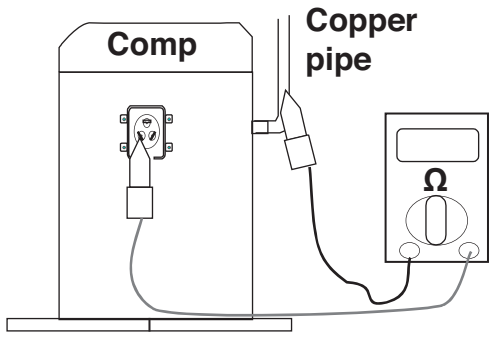
Check of compressor

■ Check resistance of the compressor



■ Check Insulation resistance of the compressor



Model	Resistance (Ω) at 20 °C		
	U-V	U-W	V-W
AHBW166A0	0.520	0.516	0.513
AHBW146A0	0.520	0.516	0.513
AHBW126A0	0.520	0.516	0.513

Resistance (Ω) at 20 °C	
Terminal	All models
U-GND	More than 2MΩ
V-GND	More than 2MΩ
W-GND	More than 2MΩ

Model	Resistance (Ω) at 25 °C		
	U-V	U-W	V-W
AHBW168A0	1.183	1.174	1.181
AHBW148A0	1.183	1.174	1.181
AHBW128A0	1.183	1.174	1.181

Resistance (Ω) at 25 °C	
Terminal	All models
U-GND	More than 2MΩ
V-GND	More than 2MΩ
W-GND	More than 2MΩ

Model	Resistance (Ω) at 20 °C		
	U-V	U-W	V-W
AHBW096A0	0.997	0.980	0.965
AHBW076A0	0.997	0.980	0.965
AHBW056A0	0.997	0.980	0.965

Resistance (Ω) at 20 °C	
Terminal	All models
U-GND	More than 2MΩ
V-GND	More than 2MΩ
W-GND	More than 2MΩ

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P/NO : MFL58346405

APRIL, 2013